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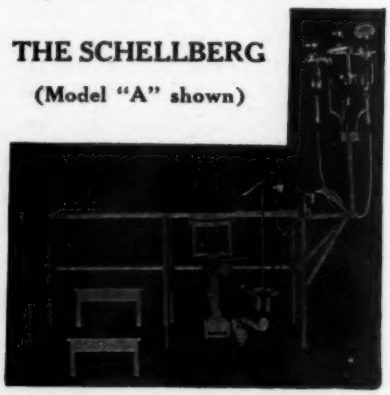

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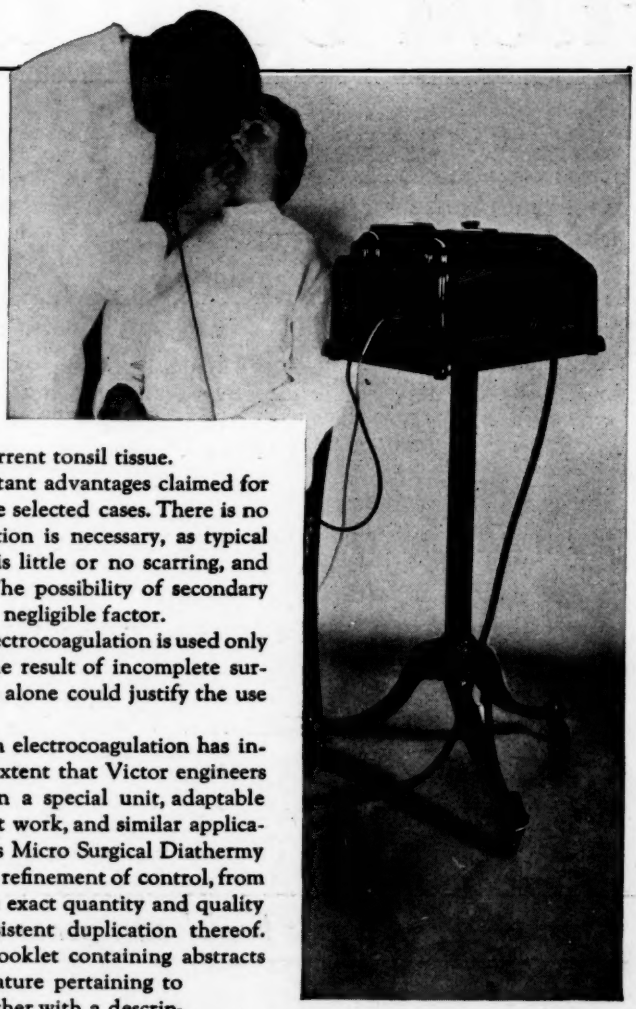

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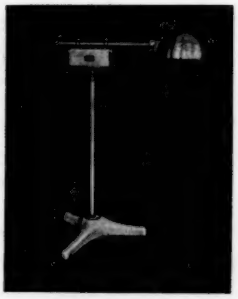

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SUNLIGHT, NUTRITION AND METABOLISM *
III. Hemoglobin Production, Erythrocyte Formation and Reticulocyte Response

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Introduction

Sunlight through its ultraviolet component exercises an important influence over hematopoiesis. Perhaps the same mechanism that controls ossification also regulates erythrogenesis. Bosányi maintains that bone is to be regarded as a physiological unit, an organic system consisting of several kinds of tissues, and that the growth of bone and the formation of new bone is dependent upon an interaction of the functions of all the different kinds of tissues. Hematopoiesis, he believes, is directly related to the process of ossification.

The Close Relation Between Anemia and Rickets

Heubner and also Marfan contend that anemia, which they believe always to be present in the rachitic child, is closely linked with disturbances in ossification. De Bosányi found marked anemia in rats on McCollum's rickets-producing diet No. 3143. In many of De Bosányi's animals the anemia was always present in the third week of feeding the experimental diet. He examined forty rats and discovered that the anemia present was in a certain degree proportional to the rachitic changes in the bone. Animals with healing rickets never had such low percentages of hemoglobin as were found in the acute stages of the disease. Rats with mild rickets showed moderate grades of anemia, whereas in rats showing well marked rachitic changes the anemia was nearly always more severe. In the case of spontaneous healing or healing produced by any anti-rachitic treatment, an improvement took place in the blood picture.

Woenckenhaus also fed rats McCollum's rachitic diet No. 3143, which is poor in phosphorus and poor in vitamin D. He observed a decrease in hemoglobin and in erythrocytes. He noted an increase in normoblasts and myelocytes and the development of polychromasia. The changes in the blood were evident before the experimental rats began to show signs of skeletal deformities. Maurer, Diez and Berendt also studied the blood of rachitic rats. Three weeks after the beginning of the rickets-producing diet they observed normoblasts in 50 per cent of the animals, and after five weeks in all the animals. Seven weeks after the experiments started they found a considerable number of normoblasts as well as myelocytes. Nucleated red cells were also present. The various cells found in the blood of rachitic animals are to be expected from the histological findings of Benjamin and Aschenheim in the bone marrow in human rickets. Happ reported that diets producing rachitoid changes in the rat may also produce anemia if the diet is prolonged. This anemia could be observed in the first generation and also in the second generation of rats.

The Remarkable Anti-Rachitic Effects of Hemoglobin

That there must be a close relation between erythrocyte building and bone building, is to be deduced from the fact that hemoglobin, according to De Bosányi, when fed to rats on McCollum's diet No. 3143 had a marked anti-rachitic effect.

Hemoglobin exerted this marked anti-rachitic effect only when given in certain definite amounts. No rickets developed in rats which were put on diet No. 3143 containing 10 per cent hemoglobin, when they were 40 to 50 grams in weight. Five per cent was the smallest quantity of hemoglobin which prevented the development of rickets. On a diet that contained 1 to 2 per cent of hemoglobin, rickets will develop just as if a rickets-producing diet has been fed without any added hemoglobin. This was the smallest percentage of hemoglobin which prevented the development of rickets. The same per cent of hemoglobin is needed to produce the

* Editorial Note—This is the final of a series of three articles by Dr. Levine.

healing of rickets. In this connection it is of interest to mention that van Leersum reported the healing of rickets by cutaneous injection of solutions of hematoporphyrin. He believed that this healing might be due to sensitization to light, judging from the pharmacologic action of this substance in the presence of light.

The healing of rickets by hemoglobin cannot be due to sensitization of the animals to light, because the effect is obtained when animals in complete darkness are given hemoglobin. De Bosányi took two groups of rats suffering from rickets. In one group he injected 10 per cent oxyhemoglobin solution. In the other group he injected 10 per cent hematin solution. Both groups were kept in darkness. Hemoglobin provided anti-rachitic potency, but hematin failed to do so. The anti-rachitic effect is apparently due to the globin factor. The hemoglobin given subcutaneously in the quantity of 0.1 gram per day had no anti-rachitic effect. The smallest amount which had a curative or preventive effect he found to be 0.5 gram per day when given by mouth.

Since globin seems to be active it is very likely that some amino acid is responsible. To prove the point arginine, lysine and histidine were mixed with rickets-producing diets in the same quantity that they are present in 5 grams of hemoglobin. Arginine proved to have a specific anti-rachitic action, but histidine and lysine proved inactive. Cystine was also anti-rachitic when it constituted 5 per cent of the ration, but not when it constituted 1 per cent of the ration. Tyrosine even when it constituted 5 per cent of the ration was not anti-rachitic.

It is interesting to note that De Bosányi applied his laboratory results to the treatment of rickets in children. He observed that the inclusion of 5 per cent hemoglobin in the daily food (cereal and milk) proved to have a marked anti-rachitic influence.

With reference to the human being, we may state that anemia is common in rickets and still more common in tetany. Mayfan and also Heubner contend that anemia, which they believe always to be present in the rachitic child, is closely linked with disturbances in ossification. Heubner stated that erythrocytes may sink to 2 or 3 million, while the leukocytes may rise to 20 or 30 thousand. The changes were somewhat proportional to the severity of the rickets. In addition to the lowering and to the increase in leukocytes, poikilocytes, nucleated red cells, megalocytes made their appearance in the blood stream. Schiff and Widowitz reported in rachitic children with severe digestive disturbances a condition of chlorosis with a marked decrease in hemoglobin without the corresponding decrease in the red cell count. In adults with osteoporosis Alwens found low hemoglobin in sixteen cases. The red cell count and the white cell count were within physiological limits. According to Cheadle and Poynton there is usually a simple anemia proportionate in general to the severity of the rickets. Morse examined twenty uncompleted cases of rickets and found the red corpuscles approximately normal in number, but the hemoglobin absolutely and relatively diminshed.

The histological picture of the bone marrow in rickets points more or less to the accompanying involvement of the hematopoietic system. The marrow, according to A. F. Hess, is markedly congested and contains a large number of blood sinuses. Fibrillar zones of connective tissue may be noted especially in proximity to infractions or fractures. The entire marrow may be atrophied. It may show lack of cellular elements associated with mucoid areas. The osteoblasts investing the walls of the trabeculae are not decreased in number, but frequently appear flat, a sign of functional inactivity. Mayfan states that changes in the bone marrow constitute a constant lesion in rickets. He therefore maintains that anemia is an important manifestation of rickets. Still also claims a relationship between the pathological picture of the bone marrow and failure of ossification. According to him, the severity of the anemia in rickets may even be altogether out of proportion to the bone changes.

Other investigators, however, find no relation at all between rickets and anemia. Findlay studied thirty cases of rickets in children between 12 and 42 months of age. He found in active and uncomplicated rickets that anemia was not the rule. He regards its occurrence as essential and due to adventitious causes. He reported, contrary to our expectations, that the number of red cells in his series was notably in excess of the normal average and that the blood corpuscles as a rule varied more in size than in normal individuals of the same age. Hess, whose observations included rickets mainly of mild or moderate degree, claims that anemia is not present more often and in greater intensity

see, however, that in view of the fact that in human experience deficiency disease is of the mixed type, that a severe rickets may be accompanied by anemia.

The effect of anti-rachitic treatment on the anemia associated with rickets seems to be variable. Levinsohn reported a case of rickets in a negro child treated with ultraviolet. The blood studies indicated a rapid rise in red cells and in hemoglobin, while the serum calcium was rising and while the x-ray revealed that the healing of rickets was taking place.

Netchaeva observed that children with rickets, tetany or anemia exposed to ultraviolet rays showed a marked increase in hemoglobin, in the number of erythrocytes and leukocytes and in the number of eosinophiles. Hess observed great improvement in the blood picture after the administration of iron without any improvement in the signs of rickets. He frequently found that where anemia and rickets were associated, the hemoglobin remained even as low as 50 per cent, notwithstanding the fact that cure had been brought about by means of cod liver oil. Small studied fourteen cases of active rickets associated with anemia. Although he obtained evidence of healing or of healed rickets he found no improvement in the blood picture. He also concludes that ultraviolet heals rickets, but not the associated anemia. The diet administered to his rachitic patients was devoid of any of the foods rich in iron or in the anemia-preventing factor discovered by Whipple and Robscheit-Robbins. His results serve as excellent proof of the fact that in the absence of material from which to build hemoglobin or red cells, ultraviolet is powerless to call forth any hematopoietic response. Laurens and Mayerson maintain in a very recent publication that radiation cannot act as a substitute for dietary deficiencies, a point which has been emphasized in studies in rickets in which it has been clearly demonstrated that irradiation is effective by virtue of the fact that it enables or permits the organism to utilize more economically materials present but not available.

Hydrogen Ion Concentration in the Gastro-Intestinal Contents in Relation to Iron Absorption

The hydrogen-ion concentration of the contents of the gastro-intestinal tract is known to influence the absorption of calcium and of phosphorus. These elements are absorbed more readily from an acid than an alkaline medium. Iron no doubt behaves in a similar manner to calcium and phosphorus with reference to its readier absorption from an acid medium. The mechanism of hemoglobin and red cell formation seems to be bound up with the free acidity of the stomach and of the small intestine.

The influence of gastro-intestinal acidity upon the absorption of iron has been studied recently by Mettier and Minot. They presented data concerning the relation of iron absorption and assimilation to the reaction of the contents of the alimentary tract. They studied ten patients with secondary anemia especially associated with a prolonged defective diet or with chronic blood loss. They administered ferric citrate or ferric ammonium citrate in varying doses dissolved in 50 cc. of water together with 200 grams of ground beefsteak digested *in vitro* for two hours at 37° C. with pepsin and hydrochloric acid adjusted to pH 3. Just before the addition of the iron the digested mixture was strained and used as such for an acid medium or for a near-neutral or alkaline medium when adjusted with sodium hydroxide solution to pH 7 to pH 8. The meal was administered through a tube passed through the patient's stomach.

The experiment on each of the ten patients was divided into four immediately successive periods. A preliminary control period was followed immediately by a period during which the iron salt in doses of from 0.5 to 2 grams was fed daily in alkaline or approximately neutral medium. In the third period the iron salt was given in the same quantity but an acid meat mixture was substituted for the neutral or alkaline one. Reticulocyte counts were made throughout the course of the observations.

Mettier and Minot found that the recticulocyte response was greater when the iron citrate was given with the acid meal than when the iron compound was administered with the alkaline meal. The investigators therefore concluded that iron was more potent for blood formation when absorbed in the intestinal tract from an acid than from an alkaline mixture. When they administered the iron compound in larger doses, they were able to demonstrate a greater recticulocyte response than with smaller doses. In order to

induce the greatest response in recticulocyte formation, which is an index of blood regeneration, not only must we take into consideration the hydrogen-ion concentration of the intestinal contents but also the quantity of iron available for absorption.

With relation to gastro-intestinal acidity, we must not forget the highly interesting fact that Abrahamson and Miller, Grayzell and Miller, and Yoder have demonstrated that gastro-intestinal acidity is increased in rachitic rats after the administration of cod liver oil or after exposure to ultraviolet. Tisdall and Price have shown that sunlight increases gastro-intestinal acidity in rachitic rats.

The acid of the digestive tract seems in a manner not yet fully comprehended to be bound up with hematopoiesis. All types of anemia show diminution or absence of free acid in the stomach. In chlorosis we find a subnormal quantity of free acid, while in sprue free acid may be present in subnormal amounts or absent altogether, while in pernicious anemia free acid is very generally absent. Faber collected thirty-three cases of pernicious anemia, all of which exhibited diminished free hydrochloric acid or entire lack of free acid. Cabot reported 76 cases of pernicious anemia, and only one patient showed free acid in any considerable quantity. Friedenwald and Morrison reported 76 cases of pernicious anemia. The majority of patients (74 per cent) showed no free acid, 19 per cent of the patients showed a markedly decreased secretion, and 7 per cent showed a normal secretion. Very few clinicians, however, would consider a patient with a normal free gastric acid as suffering from typical pernicious anemia. Levine and Ladd reported 143 cases with persistent absence of free hydrochloric acid in 99 per cent of the patients. Hurst reported pernicious anemia in 579 patients, 98 per cent of whom suffered from achlorhydria.

When gastric acid is very low or entirely absent we may expect an existing anemia or one that will sooner or later develop. Hurst has collected five cases in which pernicious anemia occurred after a gastrectomy had been performed. Ivy reported four such cases in which anemia or pernicious anemia set in. Moynihan reported one case which developed anemia, the patient dying three years and eight months after stomach resection. Cohn also reported one case in which severe anemia made its appearance after gastrectomy. Hartman reported one patient that developed pernicious anemia and died two years and ten months after the operation.

When gastric acidity is very low or entirely absent we may expect an existing anemia so severe, that it may at times pass into the pernicious type of anemia. Natanson described a case of funicular myelosis in a man aged 52 with achlorhydria, an erythrocyte count of 2,500,000 and a hemoglobin of 62 per cent. About a year later the patient's blood showed the complete blood picture of pernicious anemia. Indeed many writers have recorded observations that achlorhydria antedates pernicious anemia. Hunter cited one case in which pernicious anemia developed two years after achlorhydria was discovered. Morrison reported two cases and Kuttner several cases in which achlorhydria preceded the typical blood picture by five years. Levine and Ladd recorded one case with an interval of six years, and Cabot and Morarity one case with an interval of several years. Faber cited the record of three patients whose hemoglobins were 100, 95, and 90, respectively, when achlorhydria was first noted. Pernicious anemia developed, ten, seven and three years later. More recently Faber added two new cases where the achlorhydria antedated the onset of anemia in one patient after twelve years and in the other after thirteen years. Sturtevant reported a stretch of thirteen years between the first appearance of achlorhydria and the onset of the symptoms of pernicious anemia. Riley cited the case of a patient with pernicious anemia who had achlorhydria fifteen years prior to the development of the anemia.

Light and Darkness in Relation to Hematopoiesis

Many investigators have made a study of the effect of light and of darkness on the blood picture. Schoenfeld first made the observation that light or darkness had no effect on the blood picture. He did not find a condition of anemia in horses confined in mines for a period of from ten to twenty-four years. Grober and Sempell examined mules kept in dimly lighted mines for five to ten years and could find no decrease in red cells or in hemoglobin. Blessing, surgeon with the Nansen expedition, reported no variation in

hemoglobin content or in the number of red cells in his fellow members after exposure to the long polar nights. The failure of Schoenberger, Grober and Sempell to observe anemia indicate that the food of the animals in the mine or of the men in the Arctic was adequate from the standpoint of the food factors necessary for erythrogenesis. Vitamin D, so far as we know today, can well take the place of sunlight in the biologic economy.

The explanation given above is strengthened by the fact that other investigators have recorded a tendency to anemia in the absence of light. Graffenberger, Marti, Borrisow, Orum, Aschenheim, Koster, and Laurens and Sooy recorded a decrease in hemoglobin content and in the red cell count when the experimental subject was kept in darkness and an increase when the subject was kept in sunlight.

Jesionek points out the fact that an anemic appearance following exposure to poor lighting or darkness may not indicate an actual change in the number of red cells or in the quantity of hemoglobin, but may be accounted for by a decrease in the volume of blood going to the periphery. In this connection the observations of Laurens are of great interest. This investigator kept two dogs in darkness for a period of nine months. An initial decrease in red cells and in hemoglobin was followed by a steady increase, although at the end of eight months the red corpuscles were still at a level below normal. The dogs on readmission to light showed a further decrease and then a final return to normal. The variations noted may, however, be accounted for by changes in blood volume.

We cannot emphasize too strongly the need for the determination of plasma volume in studying hematopoiesis. Miles and Laurens made blood volume estimations on dogs exposed to carbon arc radiations. At first there occurred a decrease in blood volume. The initial decrease was followed by an increase in red cells, indicating a stimulation of the blood-forming organs obscured at first by a decreasing plasma volume. Mayerson and Laurens in a more recent communication state that carbon arc radiation applied to dogs led to a vasodilatation followed by diffusion of tissue fluid into the blood stream. Continued irradiation or irradiation repeated at short intervals led to vasoconstriction and plasma concentrated. Overheating may, however, account in part for the latter results. The response on the part of the red cells varied. Repeated exposure resulted in an increase in corpuscles ranging from 10 to 19 per cent. This rise was maintained for a period lasting from three to six weeks after the last carbon arc exposure. Excessive irradiation they found to result in fragmentation and in cell destruction.

Following massive doses, the red cells were larger and were less saturated with pigment, but in the post-irradiation periods smaller and paler cells appeared. Mayerson and Laurens explain the changes in the content and size of the red cells by assuming that during the raying period there is a minimum formation of new red cells, the system calling chiefly on its reserves. In the post irradiation period, however, the bone-marrow has exhausted its stores and now forms cells low in hemoglobin and of low color index. Osato and Tanaka, working with dogs rendered anemic by bleeding, observed that the iron content of the blood of dogs exposed to the mercury quartz lamp was higher than that of the blood of dogs, un-irradiated. At the same time the liver, kidney and bone-marrow of the irradiated dog showed a content in iron lower than that found in the same organs of the un-irradiated dog. It is evident that ultraviolet induces a migration of the iron from reserve depots to be utilized in the process of blood regeneration. In the absence of sunlight or ultraviolet iron may be stored in certain organs, but it cannot be utilized in blood building.

The Effect of Altitude on the Blood Picture

Altitude has been known to modify the blood picture so as to bring about an increase in hemoglobin and in red cells. The participants in the Pike's Peak and the Peru expeditions all agree on this fact. Estimations showed that the immediate abrupt rise in blood cells and hemoglobin was due to changes in plasma volume. Following this earlier concentration a gradual new formation of red corpuscles occurred, which by degrees overtook the original red cell volume due to concentration. The change in the blood picture is part of a compensatory process and is no doubt related to the reduced oxygen pressure and the reduced atmospheric pressure. Heat may also be a factor to be considered, since blood volume changes are apt

to occur at high temperatures. In hot climates, much of the blood is in the skin. The increase in the vascular bed may be considerable. The blood is increased in volume in order to preserve the proper relation between the quantity of fluid in the periphery and in the circulatory bed.

Experimental evidence is not wanting to prove that altitude and reduced oxygen pressure influence markedly the blood picture and the hematopoietic system. Campbell kept monkeys, rabbits, rats and mice for a period of thirty-three days in a low-pressure atmosphere equivalent to an altitude of 30,000 feet. He found an increase, in both hemoglobin and the red cells, following a preliminary decrease. He gave no data on blood volume. Schauman and Rosenquist made similar experiments, but also reported no blood volume estimations. Smith, Belt, Arnold and Carrier included in their findings both plasma volume and red cell determinations. They found an increase in hemoglobin and blood volume, following a residence of four weeks at an altitude of 10,000 feet. It is interesting to relate that Koranzi demonstrated that the increased red cell content of the blood which occurs at high altitudes quickly returned to normal upon the inhalation of oxygen.

Histological evidence points to the fact that the bone marrow is affected at high altitudes. Dallwig, Kolls and Loevenhart studied the bone marrow of rabbits subjected to reduced oxygen and atmospheric pressure. They observed extensive hyperplasia of erythrocyte-forming centers, marked dilatation of capillaries and the engorgement of the small vessels with blood.

In all the observations and experiments concerning altitude and reduced oxygen or atmosphere pressure in the blood, it is hard to understand why the influence of ultraviolet has been given little consideration. At high altitudes the ultraviolet is more intense and is not disturbed by losses due to the presence of dust particles. Hobert has shown that hemoglobin and red cells regenerate much faster in light than in darkness, and more rapidly under ultraviolet irradiation than under exposure to sunlight. Laquer observed greater blood regeneration in anemic dogs kept at an altitude of 2,900 meters than in those kept at low altitudes. The dogs in the high altitude came up to a normal blood picture in sixteen days, while the animals in the low altitude took up twenty-seven days to accomplish the same feat. Weber produced anemia in animals by the injection of acteylphenylhydrazine. He found that in high altitudes the anemia developed was less severe than in low altitudes, and that regeneration proceeded at a much greater rate. It required three times as long to complete regeneration in the low lands than in the high altitude.

Ultraviolet in the Treatment of Anemia

Experimental evidence is now accumulating to prove the importance of ultraviolet in the treatment of anemia. Laquer showed that blood regeneration in anemic animals occurs more rapidly in animals rendered anemic by the administration of acetylphenythydrazine proceeded at a more rapid rate in high altitudes. Marguerite Levy proved that ultraviolet accelerates blood regeneration in animals suffering from phenylhydrazine anemia. Laurens and Mayerson, also working with dogs made anemic by subcutaneous injections of acetylphenylhydrazine, observed that the regeneration of red cells and hemoglobin unquestionably continued more rapidly in the experimental animals that were irradiated.

Foster has shown recently that the mercury arc lamp stimulates blood regeneration in rats fed milk, a food that readily induces anemia due to its deficiency in iron and in the anemia-preventing factor discovered to be present in great abundance in liver and kidney. Osato and Tanaka produced anemia in dogs by means of hemorrrhage. Their findings, given below, indicate the therapeutic value of ultraviolet.

Red Cell Count

	Irradiated Dog	Non-Irradiated Dog
Before hemorrhage	7,740,000	6,460,000
After hemorrhage	4,700,000	4,000,000
At death	7,280,000	5,960,000

Hemoglobin

Before hemorrhage	8.8 gms.	5.0 gms.
After hemorrhage	5.4 gms.	3.8 gms.
At death	8.4 gms.	5.1 gms.

With reference to the human being, we find sufficient evidence to prove the value of ultraviolet as a therapeutic factor in anemia. Sanford experimenting with infants observed on short exposure to ultraviolet light an increase in the hemoglobin content and to a slight extent in the red cell count with a rapid

return to normal. The increase in the red cell count and hemoglobin content was greater the lower the hemoglobin content and the red cell count of the infant, and the figures also showed a great tendency to remain near the normal. Many investigators have observed that ultraviolet seems to yield more favorable increases in hemoglobin and red cells, the severer the anemia. It is doubtful whether sunlight or ultraviolet can induce an increase in red cell and hemoglobin to exceed the values found in the blood of a healthy subject.

Jongewaard, at the Iowa State College, recorded the fact that two-thirds of the girls coming to the clinic had secondary anemia, the hemoglobin ranging from 50 to 70 per cent. He advised these girls to partake of a diet rich in the materials necessary to build hemoglobin and red cells, to go to bed early, and to stay out of doors as long as possible. He also treated them with ultraviolet. His findings led him to the conclusion that ultraviolet is one of the natural mechanisms for promoting the assimilation of iron and for the production of hemoglobin and red cells.

Ultraviolet has been employed to great advantage in the treatment of tuberculosis. It would therefore be interesting to note its influence on the anemia accompanying this disease. Lapteva-Popova made a study of twenty-five persons, four of whom were well, while the other twenty-one suffered from bone tuberculosis. From her observations she concluded that heliotherapy increased the number of erythrocytes and reticulocytes and at first decreased the quantity of hemoglobin. The increase in erythrocytes continued, but after a period of quiescence, the hemoglobin began to climb. She maintains that heliotherapy has not only a beneficient influence on the blood-forming organs but also on the entire system. Pardee treated throughout the winter and spring twenty-two children with bone and joint tuberculosis with radiations from a carbon arc light. In the majority of cases the blood count rose under the treatment and the children tended to gain weight. Her findings support the theory that the effect of light upon the blood-forming tissue is a restoration of normal function, not a mere stimulation.

One of the most important contributions to the problem of anemia has come out of the investigations of Macht. This brilliant investigator has discovered the exceedingly interesting fact that the blood serum or the spinal fluid of an individual suffering from pernicious anemia is very toxic to plant protoplasm. This phytotoxic property is not shown by specimens of blood or spinal fluid coming from patients with secondary anemia. The serum of a patient suffering from pernicious anemia becomes less toxic when it is irradiated with ultraviolet. The toxicity can be still further diminished by the addition of certain photodynamic sensitizers. When the patient improves under treatment the blood serum becomes less toxic. The findings of Macht have been confirmed by many investigators.

The Effect of Ultraviolet on Blood in Vitro

Irradiation of an individual does not result in hemolysis of the red cells. *In vitro*, however, red cells readily hemolyze, according to Egoroff, to Koeppe, to Schmidt and Norman. The hemoglobin may be converted to methemoglobin. While a suspension of red corpuscles undergoes hemolysis after irradiation, the process does not take place in the presence of serum.

Why serum inhibits the hemolytic action of ultraviolet on red corpuscles has been answered by Schmidt and Norman. These investigators observed that eosin, a photodynamic substance, is capable of inducing hemolysis in red corpuscles *in vitro*. They also observed that serum and certain proteins, casein, edestin, Witte's peptone, ovomucoid, and deuteroalbumose afford protection against the action of eosin. Gelatin, however, does not inhibit hemolysis. The fact that certain proteins are effective, while others are not, led Schmidt and Norman to investigate the influence of amino acids on the hemolysis induced by ultraviolet rays or by photodynamic sensitizers. They demonstrated the interesting fact that tyrosine and tryptophane offered marked protection, while phenylalanine, glycocol, leucin, aspartic acid, alanine cystein and glutamic acid proved ineffective. The lack of action on part of the gelatine is now evident in view of the fact that it is poor in tyrosin and tryptophane.

Since the action of light cannot take place without absorption the protection afforded to red cells by certain substances against the photodynamic effect of eosin is due to the absorption of the active rays by these pro-

than in non-rachitic infants. One can readily tecting substances. Hill and Schmidt have shown that certain aromatic amino acids have the power of absorbing ultraviolet. The protection afforded by serum is due to the proteins therein, which contain effective amino acids. In the living subject we may state that the damaging effects of ultraviolet on erythrocytes are controlled by the skin and by the blood serum.

The Specific Rôle of Ultraviolet in Blood Formation

TABLE I

Reticulocyte Counts in a Normal Subject Showing a Low Reticulocyte Count in Winter and a Rise in Reticulocyte Response During the Spring Months

Date	Hemoglobin Per Cent	White Cells Per cm.	Red Cells Per cm.	Reticulocytes Per cm.
Jan. 6, 1926	80	9,200	4,810,000	800
Dec. 29, 1926	90	10,000	6,060,000	640
Jan. 28, 1927	....	.....	.....	401
March 21, 1927	....	.....	.....	16,000
March 31, 1927	....	.....	.....	16,800
April 5, 1927	....	.....	.....	16,000
May 18, 1927	....	8,400	5,320,000	14,200

TABLE II

Repeated Reticulocyte and Erythrocyte Counts in a Normal Subjejct Showing a Rise in Reticulocytes and in Erythrocytes During the Winter and Spring Months

Date	Hemoglobin Per Cent	White Cells Per cm.	Red Cells Per cm.	Reticulocytes Per cm.
Jan. 13, 1927	75	.....	4,880,000	400
Feb. 16, 1927	70	7,000	4,640,000	1,200
April 11, 1927	....	.....	.....	16,800
May 26, 1927	80	8,000	5,500,000	16,400
Dec. 4, 1927	80	9,000	4,710,000	9,200

TABLE III

Erythrocyte and Reticulocyte Counts in Normal Adults Taken Once During Winter and Once During Spring

Subject	Date	Red Count	Reticulocyte Count
5	Jan. 6	4,810,000	800
	April 5	6,060,000	16,000
31	Jan. 13	4,860,000	.....
	April 11	5,000,000	16,000
70	Jan. 6	6,480,000	.....
	April 11	6,050,000	3,600
68	Jan. 7	6,100,000	.....
	April 21	5,460,000	21,000
29	Feb. 16	4,940,000	600
	April 11	.....	8,400
30	Feb. 16	5,410,000	800
	April 14	.....	10,000
32	March 7	4,020,000	1,000
	April 18	4,940,000	10,000
34	March 7	4,6×0,000	1,600
	April 11	.....	21,000
36	March 8	5,820,000	4,000
	April 9	.....	5,600
38	March 8	4,990,000	3,000
		.....	21,600
39	March 8	4,120,000	2,000
		.....	11,200
45	March 10	5,490,000	2,000
	April 29	5,620,000	4,400
47	March 10	5,240,000	2,000
	April 9	5,620,000	4,400
48	March 11	4,160,000	2,800
	April 11	.....	12,000
51	March 11	4,970,000	2,400
	April 12	.....	6,000
52	March 11	3,795,000	2,000
	April 12	.....	6,000

In the mechanism of hemoglobin and erythrocyte formation we at present recognize the importance of protein containing the pyrrol ring or amino acids like arginine and glutamic acid. We also recognize the importance of iron and an inorganic catalyst, like copper, and an organic catalyst present in maximal amounts in liver. Whipple maintains that liver and liver extract contribute to the building of the erythrocytic stroma. It would be of great interest to determine the exact function of ultraviolet in hematopoiesis. Laurens and Mayerson have very recently shown that irradiation with the carbon arc or the quartz mercury lamp applied to dogs rendered anemic by hemorrhage and kept on an experimental diet that in itself is incapable of blood regeneration, gave pronounced increase in the number of erythrocytes and reticulocytes, but no corresponding increase in hemoglobin output. These facts are in harmony with those reported by Spence and Griffith, who observed that cell production proceeded more rapidly than did hemoglobin formation. The absence of any definite hemoglobin regeneration and the marked response to erythrogenesis and to the production of reticulocytes suggest that irradiation acts on the mechanism for the production of stroma rather than on that which by hemoglobin is available. Although the ultraviolet rays aid in the mobilization of iron in the blood-building centers, it is doubtful whether these rays are directly concerned in the production of hemoglobin.

It is generally accepted that vitamin D is in many respects the biologic equivalent of ultraviolet rays of certain wave length. Raffington and Chaney observed that cod liver oil markedly increased the number of erythrocytes but had no appreciable effect on hemoglobin content. These investigators studied the influenec of cod liver oil on the hemoglobin content and red cell count of twenty-two girls between the ages of seventeen and twenty-three, all of whom had at the beginning of the experiment a red count below 4,000,000, and in nine of whom the hemoglobin content was below 12 grams per 100 cc. After a month of cod liver oil intake the increase in hemoglobin was insignificant, but there was a decided gain in the number of red cells in all subjects but one. The minimal gain was 11.2 per cent, and the maximal gain was 33.8 per cent.

Seasonal Variation in the Morphological Blood Picture

The conclusions of Laurens and Mayerson are borne out by the fact that the red cell count and the reticulocyte counts vary with the season, being highest in the spring and lowest in the winter, the season with the least amount of available ultraviolet. Nagano has also observed a steady decrease in the iron content of the liver of the rabbit, which is smallest at the beginning of spring and highest in the early summer. The reticulocytes are premature or rather new erythrocytes with granules or a reticulum in the cytoplasm. The reticulum stains blue with brilliant cresyl blue. The reticulocytes are regarded as an index of the regenerative power of the bone marrow with reference to erythrocytes. Seyfarth was the first to show the seasonal variation in reticulocytes. The important findings of Seyfarth have been recently confirmed by Friedlander and Widemer. They made blood counts on the same individuals for a number of months and deduced the interesting relation between sunlight and the regenerative process in the blood.

TABLE IV

Deaths from Pernicious Anemia Per 100,000 Estimated Population in the States of the Registration Area (C. A. Mills)

Mean for the Years 1921-1926

Southern States

Florida	3.8	Georgia	1.4
West Virginia	3.5	South Carolina	1.2
Kentucky	2.8	Alabama	1.2
Tennessee	2.8	Mississippi	1.0
Virginia	2.2		
North Carolina	1.7	Mean for 11 states	2.1
Louisiana	1.7		

Western Plateau States

Arizona	2.7	Utah	5.0
Wyoming	2.8	Colorado	6.0
Idaho	3.0		
Montana	4.3	Mean for 6 states	4.0

Central and Northern States

Maryland	3.7	Kansas	6.9
Delaware	3.8	Nebraska	6.9
New Jersey	4.4	California	7.4
Missouri	4.7	Massachusetts	7.4
Pennsylvania	4.7	Maine	7.7
Connecticut	5.3	Wisconsin	9.0
New York	5.5	Vermont	9.2
North Dakota	5.6	New Hampshire	9.4
Rhode Island	6.0	Michigan	9.7
Ohio	6.0	Minnesota	9.7
Illinois	6.2	Iowa	10.4
Washington	6.3		
Indiana	6.4	Mean for 25 states	6.8
Oregon	6.7		

TABLE V

Death Rates from Pernicious Anemia in Various Countries (C. A. Mills)

Country	Year	Deaths Per One Hundred Thousand Population	Deaths from Pernicious Anemia as Percentage of Total Deaths
Northern Ireland	1927	10.7	0.73
Scotland	1926	10.6	0.80
Canada	1926	9.3	0.81
Irish Free State	1927	7.4	0.50
England and Wales	1927	6.8	0.55
United States	1926	5.7	0.46
Norway	1926	5.4	0.50
Netherlands	1927	4.4	0.43
New Zealand	1928	3.8	0.45
South Africa	1926	3.1	0.32
Italy	1925	2.3	0.14
Uruguay	1927	2.2	0.19
Barbadoes	1927	2.0	0.10
Nigeria	1927	2.0	0.10
Philippine Islands	1925	1.8	0.10
Straits Settlement	1927	1.5	0.05
Hawaii	1927–28	1.5	0.13
Iceland	1911–15	1.2	0.09
Haiti	1927	0.3	0.06
Ceylon	1928	0.3	0.01

TABLE VI

Deaths from Pernicious Anemia Per 100,000 Estimated White and Colored Population (1927) — C. A. Mills

State	White	Colored
Missouri	4.4	0.0
Kentucky	3.2	1.4
Florida	3.0	2.3
Tennessee	2.7	1.2
Virginia	2.5	1.5
North Carolina	2.4	1.2
Maryland	2.0	0.4
South Carolina	1.9	1.1
Alabama	1.8	0.8
Louisiana	1.7	0.15
Georgia (1928)	1.1	1.2
Arkansas	1.0	1.4
Mississippi	0.9	0.5

Climatic Variations in Death Rate from Pernicious Anemia

Pernicious anemia is a disease in which the color index is more than one. In this disease there is a marked decrease in the red cells, while the hemoglobin is comparatively high. Since ultraviolet is concerned in the building of the red cell, particularly through the formation of its stroma, it should follow that the incidence of pernicious anemia would vary with climatic conditions. Hunter has emphasized the seasonal variations in the character of the onset and of the relapses and remissions in this disease. Patients are apt to grow worse towards the end of the winter and to improve in the summer.

Mills has made a statistical study of deaths from pernicious anemia. From his studies we find that the number of deaths from pernicious anemia is generally less in countries with a greater amount of available sunlight. The nearer the equator the less fatal becomes pernicious anemia. He has pointed out the fact that the southern states have the least incidence of mortality due to pernicious an-

emia and that the more northerly states have the greatest incidence. Florida, California, and Colorado—states blessed with an abundance of sunshine — have a high mortality rate. This high rate is probably to be attributed to the fact that these three states serve as congregating points for sick people from other parts of the country.

It is interesting to note in Table V that the British Isles, which have a high incidence of rickets, also have a high death rate from pernicious anemia. Although Iceland is situated far north, it enjoys a considerable amount of sunshine. Rickets is infrequent there. Pernicious anemia is also a rare disease in that island.

The difference in the mortality rate for pernicious anemia cannot be racial. Some of the countries with low rates are Italy, Uruguay, the Straits Settlement, Nigeria and Haiti. Italy, Uruguay and Iceland are populated mainly by the white race. Ceylon, the Philippine Islands and the Straits Settlement are occupied by the yellow and the brown races. Nigeria and Haiti are peopled by the black race.

That climate alone is not the only factor to be considered is realized from a comparative study of the death rate in the white and in the negro population in the southern states (Table VI). Colored people in these states seem to enjoy greater freedom from this disease. The reason for this is not clear. It may be that the white man in the south lives a life of an indoor person to a much greater extent than does the negro and has much less of his body exposed to sunlight.

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PHYSICAL THERAPY IN CARDIAC DISEASE *

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The purpose of this paper is to present, in short, our experiences as internist with a few of the several physical agencies lately applied in cardiac disease. We trust the transgressions of this meagre contribution to an extensive subject may be received with indulgence, for the limited time enables us to touch but briefly upon the modalities used and heart conditions treated.

The patients studied in this series were personal and thus few, for the functions of the Institute † are diagnostic and but little therapeutic. We reviewed the last fifty consecutive heart cases which came under observation during the past two years and a half. Of these, twenty-six were female with an average age of 52, and twenty-four were males averaging 53 years. The series includes ten hypertension cases classified *essential* as understood today, seven hypertension of the arteriosclerotic type without definite coronary disease, eight severe and twelve milder cases of coronary sclerosis, seven valvular cases with chronic degenerative myocarditis of various degrees, three of coronary thrombosis and two of syphilitic aortitis. Four of this series were complicated by diabetes, five had gall bladder infections or calculi, five nephritis, two hyperthyroidism, two marked obesity and one hemoplegia. Abnormalities of the colon were found in the majority, twenty-six cases.

The average number of physical treatments comprising one or more modalities was fifteen, applied over a period of from one to three months. The average blood pressure reduction remaining stationary for a more or less prolonged period after a course of treatment was 28 mm., the lowest being only 5 mm., the highest 75 mm.; the reduction per treatment was 2 mm. Hg.

Subjective improvement was marked in most cases, in some more than warranted by the reduction of pressure alone; in many electrocardiographic checking after a course of treatment showed considerable improvement in conduction and function. With the exception of three who died from various causes, the remaining are, to our knowledge, enjoying fair freedom from symptoms.

With this introduction permit me now to describe the physical modalities used and diseases treated, illustrating our remarks with a few illuminating cases.

Cardiac Mortality

Let us first recall a few facts concerning heart mortality. All must admit that the number of deaths from cardiac causes is rapidly on the increase; from fifth place on mortality tables only a few decades ago it has risen to the honorable or dishonorable position of first on the list. Statistics of United States Department of Commerce for the registration area of the United States show that deaths from heart disease have grown from 132 per 100,000 population in 1900 to 185.5 in 1925; and that of a total number of deaths, in 1928, of 1,378,675 in the same area, the greatest percentage was due to cardiovascular disease.

The enormous number of people afflicted with heart disease in our country is indeed appalling. If, as estimated, only one of ten "cardiacs" dies during the year, there must then be, judging from the number of heart deaths yearly, at least several million heart sufferers in the United States.

In New York State, exclusive of Greater New York, heart deaths (1) are one-and-a-half times as many per 100,000 as in the nation, having risen from 241, in 1916, to 303, in 1926. In New York City the rate is even higher than in the State. Here 17,079 deaths occurred in 1928 from heart disease alone, or more than the combined number from cancer, tuberculosis, nephritis and other death dealing diseases.

The medical profession contributes, unfortunately, more than its quota toward this mortality and leads all other professions, trades and occupations in heart disease. Of 2,792 reported deaths in 1928 (2), 884 or almost one-third were due to heart disease, being first on the list, while cerebral hemor-

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rhage, a vascular disease, with 328 was second, and pneumonia with 272 deaths was third. Cancer, perhaps the most dreaded of all with its 248 deaths among physicians, was only fifth.

How can this great mortality be explained? Why is the death rate for every specific age group above 35 increasing with age till, say at 70, it has doubled in 1920 as compared with 1900, now much higher than formerly? Albert (3) ascribes it to several factors: First, to the greater number of persons attaining 45 years and over, the heart disease age; the average life expectancy in 1901 was only 49 years, while in 1926 it was 59; being prolonged by ten years, more persons are now reaching an age when death from heart disease is more natural. Second, he further feels that mortality is heightened by decrease in deaths from infections, particularly those in which cardiac sequellae are frequent, as scarlet fever, diphtheria and rheumatism. Since those escaping death from the infectious diseases must later die of some disease, most likely they would succumb to the sequel of the infection, heart disease; and thus, in a measure, the number of cardiac deaths is increased. And third, he argues, in old age the heart in very many instances undergoes definite arteriosclerotic changes constituting, properly speaking, normal senescence, and as this finally terminates in cardiac asthenia and death, it becomes an added factor in the rise of cardiac mortality.

While the above explanations are very plausible and apparently true, there are, we believe, additional factors which account for the increased heart mortality, as well as for the morbidity: First, in our days when great efforts are made toward correct heart diagnosis, with the introduction of electrocardiography and teleroentgenography, with a clearer understanding of coronary disease and its consequences, many deaths formerly erroneously diagnosed and ascribed to other causes as "acute indigestion," "acute pancreatitis," etc., are now correctly identified with the heart and help to swell its mortality. Second, the continued increase in diabetes, obesity, nephritis and other degenerative diseases incurring cardiac complications adds to the already high cardiac morbidity from other causes. Third, other factors, such as the great tension under which we live, the excessive demands made upon our physical and mental forces, the emotional stress our nervous mechanism is daily subjected to—are all conducive toward vascular changes, leading to final cardiac exhaustion and failure. All these factors help increase cardiac mortality despite the decrease of immediate deaths from cardiac complications following acute infectious diseases, formerly more prevalent than now.

We are stating these facts only to recall to your attention the enormity of the problem; indeed, it is the most important the profession is called upon to meet. Tuberculosis and other infections which only yesterday took the highest toll of life have now been relegated to a but secondary consideration, thanks to the tireless efforts of medical men and the co-operation of the American public. Even death-dealing cancer, another of our scourges, is today occupying but a fifth position on the mortality list, whereas cardiovascular disease is first. It is the great enemy we have to combat if we are to accomplish our aim of prolonging life and giving comfort to the suffering invalids. Any contribution, no matter how small, which will aid in this purpose should, we feel, be welcome.

Physical Therapy

The application of physical agencies in the treatment of cardiac disease is not of recent origin. For many decades thousands of heart sufferers have been flocking to the spas of Europe, there to obtain the benefits of well organized curative systems. The means employed in these *kurorts* are chiefly physical; various types of balneotherapy, graduated exercises, scientific well applied massage, rest cures and similar methods; regulation of diet and hygienic living are, of course, also enforced. That the physical therapy utilized in those places must be satisfactory may be concluded from the fact that a great number of people, in numbers ever on the increase, make their pilgrimages to these places year after year, evidently pleased with results. The intelligent European, more than the American, is quite keen in his appreciation of the useful from the useless and, too, well informed as to the advantages of phyiotherapy as applied in various conditions. In the United States health resorts are few, and the idea of *kurorts* in the sense in which they are operated abroad has not yet been established here; the public is yet but little acquainted with the advantages of physiotherapy.

Before the war, physical therapy was looked upon in our country with great distrust and disfavor, and one practicing it was usually considered "irregular and a quack." But during the war the medical profession while "over there," where physiotherapy has been held in high esteem and in use for many decades, had the opportunity of studying various modalities and their usefulness. In reconstruction work it soon became evident that in order to obtain quick and satisfactory rehabilitation, resort must be made in almost every case to physical therapy. Hence, this became very popular, indeed so popular that today the physician who in suitable cases neglects the use of physiotherapy is looked upon as doing an injustice to his patients, whereas an institution lacking complete physiotherapy equipment is not considered modern. But in spite of its recent progress and the recognition obtained in the profession, physiotherapy is still inadequately used for the benefits it offers. Diathermy, heliotherapy and autocondensation are coming more and more into vogue and promise in time to surpass in popularity the older methods heretofore in use. Only recently have the modalities attracted the attention of internists and heart specialists.

The Heart

Before we proceed to describe the cardiac disturbances treated, it might be well to glance for a moment at the circulatory and nervous mechanism of the heart, as the basic principle of physical therapy in cardiac disease is improvement of coronary circulation and steadying nervous function. Only lately was it assumed that the right and left coronaries monopolized the corresponding parts of the heart and were terminal in character. Recent studies, however, have shown this to be untrue. It is now known that "The right coronary artery in the typical average heart supplies the entire right ventricle with the exception of the left third of the anterior wall. Besides this, its *rami ventriculares sinistri* supply the right half of the posterior wall of the left ventricle, and a small strip of the interventricular septum. The left coronary artery, on the other hand, supplies the whole remaining part of the left ventricle, the small left anterior portion of the right ventricle not supplied by the right coronary artery and a small anterior strip of the interventricular septum. The areas of junction on the posterior surface of the left ventricle and on the anterior surface of the right ventricle, where these divisions meet, are supplied by both vessels. Thus, the intervening portion of the interventricular septum is supplied by branches from the *ramus descendens posterior dexter and ramus descendens anterior sinister*" (4).

The normal function of any tissue is dependent upon adequate nutrition, and any impairment of this is followed by characteristic pathologic changes and clinical manifestations. Myomalacia cordis, infarction, necrosis and fibrosis are results of defective muscular nutrition of circulatory origin. For some reason, the left anterior descending and circumflex arteries are most prone to pathological invasion and the areas supplied by them to degenerative changes. Defective nutrition affects heart muscle's cardinal properties: tonicity, contractility, excitability and conductivity, and results in disturbances characteristic of each. Deficient arterial circulation injures the conduction system and in accordance with the vessels affected, the corresponding conduction paths may suffer; injury to the sino-auricular node or Erlanger's pacemaker or Tawara's head of the His neuromuscular bundle with its dividing branches, or the junctional tissues, may cause the deranged rhythm and activity. Nor is any spot harboring the fibres of Purkinje exempt from degenerative invasion, if its blood supply is interfered with for some reason.

The terminal fibres of the sympathetic and parasympathetic systems may, where injured by an inadequate local blood supply, also produce clinical symptoms. As the filaments of the right vagus control the sino-auricular node and influence pace of cardiac rhythm, and those of the left embrace most of Tawara's bundle affecting conductivity of the excitation wave, these functions may then suffer. The superior and deep nerve plexus' are entwined around the base of the aorta and when irritated by mechanical pressure of an enlarged or calcified aorta, cause pain in the upper region of the sternum from which many suffering from aortic disease complain.

The necessity for perfect circulation and neuro-muscular nutrition for normal functioning of this highly specialized organ, the heart, is self-evident; without it, good health and life are impossible.

Cardiac Disturbances

ANGINA PECTORIS:—Let us now present a few of the disturbances in which we found physiotherapy helpful; the most effective results were obtained in anginas, with or without coronary disease or arteriosclerosis.

Precordial pains are common in heart affections; they may vary from very slight distress or discomfort to the most excruciating, agonizing pains, the sufferer imploring death. The pains are transient or persistent and usually follow mental excitation or some exertion, at times trivial. Not infrequently they are associated with ingestion of food (5); aerophagia and flatulence then become provocative factors.

The sensory nerves of the heart are connected with the spinal roots, from first to the eighth dorsal; pain impressions originating in the heart are communicated to these roots and transmitted to the superficial areas they command. For this reason, anginous pains may be felt in supra- or infrasternal regions, the left and less frequently the right arm, the face, the jaws, the neck, chest and other places, depending upon the site of pain origin and spinal nerve transmission. It is thought that ventricular pain is distributed to the area supplied by the second to fifth dorsal, pain from the auricles by the fifth to the eighth nerves and for the ascending arch, the third and fourth cervical and first to third dorsal.

Some pains are readily connected with evident pathological processes are aortitis, coronary thrombosis, coronary sclerosis, aorta valvular incompetency, etc.; others are not easily traceable to their causes and then are falsely termed pseudo-angina. Not infrequently, however, these turn out to be the forerunners of severe angina and are not toxic or neurotic, as frequently erroneously assumed.

Precordial pain in hypertension of sclerotic origin is usually due to coronary disease. There are instances, as Libman (6) states, where such pain is present without narrowing of coronary blood vessels and without dilatation of the arch, but these cases constitute a minority. In such instances the pains are due to sudden strain upon the heart or are early messengers of coronary thrombosis.

The conditions in arteriosclerotic hypertension differ from those of the essential type in being primary and displaying pathology in the heart and blood vessels. The heart, especially in the young, because of its increased labor in meeting the strain from hypertension of various origin, is early hypertrophied, but it remains so for many years before dilatation sets in and its insufficiency becomes evident. This, in most instances, results from sclerosis of its coronary vessels which decreases the nutrition, tone and resistance of its musculature. The left ventricle, the one bearing the greatest burden, is affected most often, and its failure occurs in about 90 per cent of hypertension cases.

Electrocardiographic studies offer great aid in disclosing serious damage to the heart. Some patients with severe coronary affections have almost no complaints, but their electrocardiographic tracings reveal the real situation. Precordial distress is, luckily, quite common, and whether mild or severe, substernal or other, should always serve as a warning to give the case immediate attention and investigation.

Physical therapy in angina, with or without coronary involvement or renal disease, is quite effective. Drugs are often inevitable; nitrites, narcotics and purin derivatives have to be resorted to in the severer cases; in milder, more lasting relief is often obtained by diathermy; its repeated use for prolonged periods gives great satisfaction. Some of our patients could not bend down to tie a shoelace or could not walk fast or even slowly for short distances without being compelled to stop because of pain; others could not bear cold weather or walk facing the wind; few could walk stairways—all such were considerably relieved by repeated diathermy and autocondensation in addition to general treatment; a few examples might here be cited

Case No. 11653—Mrs. S. S.—Age 60—Ref. for investigation and treatment by Dr. A. E. Sommers—Angina pectoris, Moderate left basal carditis, Coronary sclerosis. Complaining of precordial distress, pain affecting both arms, most common at night, upon walking and any exertion particularly stooping; also infrequently after meals. Besides, suffers constipation, frequent nausea, decreased vision and dizziness. Past and family history with exception of cancer, negative. Weight 155 lbs., B. P. 164/90, pulse 104; blood chemistry, Wassermann, urine, temperature, etc.—normal; uric acid increased. Electrocardiogram—Marked left axis deviation, myocardial degeneration left base, coronary sclerosis. Colon—redundant sigmoid, dilated ascend-

ing and hepatic, incompetent ileocecal valve, localized spasticity.

After 17 physical therapy treatments (colon therapy, diathermia, autocondensation, several ultraviolet), weight 153 lbs., pulse reduced to 88, B. P. to 140/100, complete alleviation of all symptoms now for over a year.

Case No. 10949—Mrs. A. R.—Age 54—Ref. by Dr. N. Rappaport—Angina pectoris, Coronary sclerosis, Sinus arrhythmia, Diabetes. Complained for some time of sticking and other parasthetic symptoms left forearm and chest, burning gnawing feeling in precordium, total inability to attend to household duties, accentuated by aggravation and physical stress. Height 5'0", weight 154 lbs., heart enlarged left, sounds muffled, no murmurs, B. P. 190/90, pulse 80. Hemoglobin 79%, R. B. C. 3,860,000, B. M. R. plus 9, glycosuria, mild albuminuria. Blood—152 mgs. dextrose, 4.8 mgs. uric acid. Colon — marked ileocecal incompetency, kinked angulated transverse. Electrocardiogram—sinus arrhythmia of coronary origin. After 12 treatments—weight 140 lbs., B. P. reduced to 160/80, blood dextrose 104 mgs., uric acid 2.6 mgs., all symptoms markedly improved for past ten months.

Coronary Thrombosis. Only three cases of coronary thrombosis are included in this report because not many are fortunate in escaping death from their first occlusion and later able to utilize ambulant physical therapy. The three treated cases were of the milder type which Levine (7) classifies prognostically into the second group of favorable cases. One suffered periodical anginous pains before his thrombotic accident; one had practically no symptoms to make her cognizant of her serious affection. The third applied for treatment because of persisting and uncomfortable aching of arms, a gnawing pain in interscapular region and drawing sensation at the back of the neck, with substernal pressure.

We used diathermy here not only because of its value in relieving pain, but more particularly in the hope of dilating blood vessels, effecting ventricular nutrition and promoting the healing of small infarcted areas. We can not state of the changes induced in the tissues of those treated, but we may frankly say that they were symptomatically improved and pleased with the results of our treatments.

Case No. 11249—Mrs. F. B.—Age 39—Ref. by Dr. H. R. Litchfield—Mitral stenosis and insufficiency, Coronary thrombosis. Patient referred for puffiness of ankles, considerable dyspnea, cardiac palpitation, precordial distress occurring during previous two weeks. Had been a cardiac since rheumatic attack in her early girlhood. Weight 180 lbs., B. P. 215/90, pulse 96, heart bilaterally enlarged, mitral systolic and stenotic murmurs, precordial fremitus, moderate pretibial and ankle edema. The decompensation event treated as usual for several weeks, then physiotherapy with reduction of B. P. to 200/100 and disappearance of previous complaints for 6 months. Suddenly an acute attack of precordial distress, marked dyspnea and orthopnea, and other typical symptoms of thrombosis including the Parde T wave, with elevation of temperature from 100 to 101, a leukocytosis, fibrillation and drop of B. P. to 140/75—occurred lasting for almost two months when patient was enabled to leave house and receive physiotherapy for the persistent aching of upper extremities including a drawing sensation in back of the neck. After several weeks of treatment this was cleared up. This case of essential hypertension complicated by valvular disease has benefited by the physical therapy not only during the stage of decompensation from beginning myocardial bankruptcy as the result of her hypertension, but also after the thrombotic accident and its remaining and persisting symptoms affecting various parts of her body.

Essential Hypertension. The treatment of essential hypertension is at best unsatisfactory because its underlying causes are obscure and thus beyond reach of attack. Some improvement may be obtained with any of the methods now employed: diet, drugs, protein injections, organotherapy, hygiene, etc., but is usually temporary and of little advantage to the patient. In many instances no treatment is really most desirable, but as most sufferers are conscious of their condition, and hypertension is the talk of society, some form of therapy must be instituted to satisfy the mind and relieve anxiety.

The real treatment of essential hypertension is individualization, tactfulness and moderation. "Moderation in all things should be the watchword" (8). Attention to exercise and hygiene, the limitation of protein and perhaps chlorides in some cases, the elimination of all excesses in food, coffee, tobacco and other stimulants are, of course, useful.

But most satisfactory is the judicious use of physiotherapy. Autocondensation is serviceable if given for prolonged periods. Even if the arterial tension is reduced thereby but slowly and only a few millimeters at a time,

or temporarily as some claim, nevertheless its use is profitable and should be encouraged, for by reducing the burden upon the heart, we stave off for a considerable time final cardiac exhaustion, decompensation and failure, —the terminal phases of essential hypertension. Electric cabinet sweating gives great satisfaction wherever hypertension is associated with obesity, blood nitrogen retention or renal dysfunction, sweating being forced only to a degree without unnecessary exhaustion and weakness.

We have had satisfactory experience with physical therapy in many hypertension cases not included in this series. As previously stated, we obtained an average of 2-3 mm. lasting reduction in most cases, and 15-25 mm. after 12-18 treatments, as in the few cases illustrated.

Case No. 9776—Mr. W. M. E.—Age 54—Ref. by Dr. S. Close—Essential hypertension, Myocarditis chronica. Complained of frontal headaches, mental depression, insomnia, exhaustion, nervousness and in addition constipation, eructation of gases, abdominal distention, lack of concentration. Has a tubercular family history, suffered several attacks of influenza, typhoid fever, tonsillectomies, etc. His weight 143 lbs., B.P. 198/105, pulse 116, no murmurs. Hemoglobin 78%, R. B. C., R. B. C. 3,900,000, B. M. R. Minus 9, uric acid 3.3 mgs., Wassermann negative. Electrocardiogram—Tall R 1, 2; S in 3; flat T 1, inverted T 2, 3; covered S-T 2, 3. Colon—dilated atonic cecum, ptosed transverse, large ampulla. Kidneys, all organs—negative.

After 12 P. T. treatments—weight 139 lbs., B. P. reduced and constant to 160/90, pulse 88, improvement of all symptoms, permitting return to business.

Case No. 12066—Mrs. R. J.—Age 41—Ref. by Dr. B. Magoon—Essential hypertension, Mild hyperthyroidism, Uricacidemia. Complained of constant dizziness, nervousness, tremors, occasional headaches, weakness, disturbed sleep, at times palpitation, poor memory. Weight 159 lbs., B. P. 210/120, pulse 130. Laboratory tests—negative urines, B. M. R. Plus 15, 4.5 mgs., hemoglobin 80%, R. B. C. 4,100,000, negative W. R. Heart, lungs, abdominal organs, kidneys, blood vessels—no pathology. After 18 P. T. treatments—B. P. 150/80, pulse 110, general improvement throughout with exception of rapid pulse which was later corrected by thyroid therapy.

Physical Modalities Used

The physical agencies and the reasons for their application in the type of cardiac cases described, will now receive brief mention.

In order to determine the correct constitutional and pathological status of the individual, every case in our series was given first of all a thorough physical study and an exhaustive laboratory examination: electrocardiography, blood chemistry, Wassermann, x-rays, etc. Every attempt was then made to clear the patient from the infection disclosed in the study. All associated gastrointestinal, gynecologic, respiratory and genitourinary complications were corrected in a manner best applicable in each instance. Obese cardiac cases were placed on special diets, given graduated exercises, sweating, Bergonie electricity and massage; uricacidemia and nephritides were prescribed elimination and other appropriate therapy. Every patient's colon was radiographed and the stools cultured for the presence of intestinal intoxication, and where found, it was treated in accordance with the most accepted measures. Only in conjunction with these were the following agencies used.

High Frequency. High frequency was found to be of great service in our cardiac disease because it offers a way of reaching deep seated organs with heat. Since 1891 when d'Arsonval first introduced high frequency currents until DeKraft (9), Nagelschmidt (10), Lonergan (11), von Berndt and others called attention to their medical value and taught us their application in clinical cases, high frequency was but little used in medicine. Lately it has received more serious attention.

Medical diathermy has a broad field of usefulness in the cardiac conditions described. Its benefits result from several factors: First, the development of heat in accordance with strength of current, which depends upon impressed voltage, amperage and time; the nature of tissues traversed and their resistance in the path of current, varying considerably but generally amounting to about 500 ohms; then, upon the general heat equilibrium of the body, and finally upon current density. Second, the benefits from diathermy are further due to the local hyperemia following the induced heat; third, to biochemical changes in tissues not as yet quite fully understood; and fourth, to psychogenic stimulation, not a negligible factor either.

Although some experimenters as Brown, Alt and Levine (12) concluded from their animal experimentation that the heat obtained

from currents commonly used by clinicians is insufficient to produce therapeutic effect, the work of Nagelschmidt (10), DeKraft (9), Cumberbatch (13), von Berndt, Titus and other authorities, in cardiac, pulmonary, arthritic and other diseases are so convincing, that one doubts whether the experimental data on healthy animals may be applicable to diseased conditions in the human.

Our results with diathermy have been very satisfactory. We use a popular apparatus generating a rapidly reversed current of ample voltage, applied in the customary manner. In the heart cases we employ from 800 to 1200 milliamperes, beginning with about 500 for 10 minutes to 1000 and 1200 for half an hour at later treatments, being guided by circumstances and the condition of patient during treatment. The electrodes, larger posterior and smaller anterior, of regulation tin and size, are kept in place by sandbags, the patient lying on his back. Treatments were given in this series every second or third day for several weeks and months as the case demanded. Where unpleasant symptoms occurred, as perhaps some burning, general weakness, nauseous feeling, etc., treatments would be discontinued and small doses administered at the next session.

AUTOCONDENSATION. In autocondensation we have another valuable modality of high frequency, the patient's body here forming part of the accessory condenser circuit derived from the d'Arsonval solenoid. This current is effective in cardiac cases because of its stimulating action on the chemical processes of the organism; the promotion of tissue oxidation and waste elimination by favoring total combustion to final by-products and dilatation of peripheral blood vessels and thus lowering general arterial pressure.

Repeated checking of blood pressures before and after a treatment has long ago convinced us of the usefulness of this therapy. We used this modality mostly in our hypertensive cases. In about two months' treatment in many instances a permanent reduction of 25 to 30 mm. of pressure was obtained, enough to give relief to a strained heart and ward off serious consequences.

MASSAGE. We found massage to be invaluable because of its assistance to circulation. Muscular contraction, as is known, is the result of energy created by the glycolytic conversion of stored muscle sugar into lactic acid. Such conversion is almost instantaneous and independent of the immediate supply of oxygen in the muscle. If oxygen is plentiful the formed lactic acid is soon destroyed into final oxidation products, but when inadequate the acid accumulates, producing acidosis with muscular fatigue, indisposition, weakness, etc.

In heart disease where circulation is naturally impaired and the oxygen reserve in tissue is deficient, tissue respiration is often hampered and lactic acid accumulation with its effect upon the organism is enhanced. This is particularly true whenever a cardiac patient subjects himself to inordinary strain or muscular effort, a condition demanding extra oxygen to meet the formed lactic acid which it is unable to do; the resulting acidosis then causes certain metabolic phenomena, rapid breathing, distress and fatigue. In the healthy person, the oxygen reserve is adequate to meet such increased effort and function is quickly restored; in the cardiac subject with lowered reserve and oxygen deficiency, the debt is not readily discharged and dyspnea is considerably prolonged. This respiratory difficulty is further aggravated by a lowered vital capacity, which is common in heart disease and increases the dyspnea upon exertion, at times leading to congestion and failure.

Any measure which assists the circulation, increases the oxygen content in the tissues, decreases their lactic acid accumulation and promotes removal of other waste is helpful to the organism. Such is proper massage and judicious exercise, for in cardiac disease they accomplish all these. Where this is properly applied and regulated in each case according to circumstances, massage assists vascular and lymphatic circulation, restores strength to weak muscles and promotes metabolic changes. Its help is inestimable in the obese patient suffering from cardiac complications, who on account of the prescribed rest, lack of voluntary desire for exercise and an abnormal appetite rapidly accumulates adipose tissue which deep massage helps in removing. We used massage in almost every case under treatment.

COLON THERAPY. To the colon is assigned the most important function in the elimination of waste and toxic substances, which if not promptly excreted are reabsorbed; as these cause an endless chain of symptoms and degeneration changes with cardiovascular symp-

toms, it is essential in every cardiac to ascertain the condition and function of the bowel. Wherever found abnormal, atonic, displaced, deformed, adherent or spastic, every known means toward the correction of the abnormality must be employed and the colon restored to its normal function; otherwise treatment of the general condition or of the cardiac apparatus will be of no avail. It is interesting that of 50 cases, twenty-six had some form of colon abnormality.

In every one of our cardiac patients we thought it imperative to study the colon with x-ray pictures and make search for intestinal autointoxication. Whenever abnormalities were disclosed, physical therapy was employed to overcome these. High colon irrigations of alkaline fluid were administered twice weekly, until all gases, retained masses, mucus, etc., were removed and clear returns obtained. Then deep incandescent lamp therapy was introduced to relax abdominal walls preparatory to manual massage to correct existing displacements and adhesions. Cases of atony, dilatation and ileocecal incompetency received in addition Morse wave current or galvanic sinusoidal; spastic colons received relaxing treatment. Colitis cases, ulcerative or mucous, were treated also with astringents or other medicated solutions, putrefactive and fermentative diarrheas with measures directed to change of their bacterial flora.

Conclusions

1. Attention is directed to the seriousness of the present cardiac mortality and the need of abating it.
2. A study of fifty cardiovascular cases of various types successfully treated by physiotherapy is presented.
3. The diseases treated and the methods of approach are briefly discussed.
4. The physical agencies employed, their physiological actions and reasons for their applications are described.

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SHOULD THE HOSPITAL FURNISH AND MAINTAIN ADEQUATE PHYSICAL THERAPY SERVICE? *

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Man has used physical elements for the relief from human ills for ages. Peoples have incorporated certain ones in their religious atmosphere; men of science have demonstrated the characteristic qualities and application in treatment of diseases and disability conditions. Charlatans have been quick to seize upon simple facts, surround one or more of them with attractive embellishments and reap a rich harvest from the gullible public.

For a long time reputable physicians have used certain physical agents extensively in medical treatment. The predominence of quackery overshadowed their legitimate work, hence the medical profession underestimated the true value of physical therapeutics. The attempts to extend the real knowledge of the application and employment of rational therapeutics (physical) therefore went unrecognized and became neglected. There were men high in the medical profession at the beginning of the World war who determined that physical therapeutics as well as all other reasonable adjuvants in medical and surgical treatment be mobilized. Intensive training was given those physicians who would supervise and the technicians who would administer physical therapy treatment. At the end of the war, physical therapeutics assumed a respectable standing and become more broadly used in the regular medical profession as a rational adjunct in medical practice. Today the use of physical therapeutics is brought before the medical student in most first class medical schools; nurses receive training in certain branches essential in their profession; physical therapy technicians are being trained in the application of the various physical agents under medical supervision. Hospitals are furnishing adequate physical therapy service, just as x-ray or clinical laboratory, and provision is being made for such physical therapy as is deemed necessary in the construction or new planning of modern hospitals.

A few weeks ago at a conference of leading hospital representatives, called together by the American Medical Association in Chicago, I listened to the discussion of problems uppermost in their work. It would appear that the problem of physical therapy from the hospital viewpoint is still in an unsettled state.

Physical therapy is nearing the status of a recognized adjunct in medical practice. Knowledge of rational physical therapeutics is also widely disseminated, and the question of their use has become one of considerable medical importance. The public therefore has a right to expect guidance from the regular medical profession on its rational aspects, both beneficial and harmful.

The outstanding physical procedure is phototherapy—the application of visible light—in its various phases in medical treatment. Apparatus has been evolved to produce artificially, sunlight or a predominance of rays at either end of the spectrum—the infrared or the ultraviolet. From the scientific data available there is much definite knowledge concerning its value in medical practice. It may be used on a large scale, as in heliotherapy, by allotting considerable area both inside and outside the hospital. In the former a single or cluster of carbon arcs are so placed that 15 to 30 patients may receive exposure at one time. The out-of-door method is the better, but here the patient should be taught the facts about its limitations of usefulness. With the mercury quartz lamp the richest ultraviolet radiation is obtained; and its employment under medical supervision for either bactericidal, stimulative and tonic or destructive effect, can not be duplicated by other means. For the production of heat to a part no better mehod is applicable than infrared radiation. Present equipment is adaptable to the use required; namely, from larger lamps for body exposure to the smaller type attachable to the ordinary electric light socket, readily applied

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at the bed side. This is the best substitute for the hot water bottle, compresses, the cautery or counter-irritation, with the least harmful results. These rays produce the deepest tissue penetration, bringing about a better and more active vascularization at the desired area.

In the therapeutic use of electric current much advancement has been made in our knowledge and technic of the high frequency currents in relation to internal medicine and surgery. Diathermy is the convenient method of producing heat in the body tissues—deeper than the surface. While scientific research has as yet not fully confirmed the many claims made in regard to diathermy, particularly its penetrating qualities there is an abundance of clinical evidence that physiological effects such as active hyperaemia, artificial pyrexia, analgesia, antispasmodic, bacterostatic and absorptic influences are induced. In electrocoagulation, desiccation and electro-thermic dissection the surgeon finds better, more skillful, and safer methods in his work. The American College of Surgeons, in sponsoring these methods, have donated to certain hospitals high frequency surgical units to increase its employment by leading surgeons throughout the United States. The application of the high frequency currents to produce artificial hyperpyrexia, the most recent contribution in the field of physical therapy, should be employed with caution and due consideration. Its possibilities still remain to be explored in most every direction except paresis. The galvanic current is still the best known measure for the treatment of paralysis, and the Faradic current for the improvement in tone and strength of weak muscle and ligamentary tissue.

The role hydrotherapy plays in medical treatment is generally recognized. What would the sanatoria and asylums do without this hospital facility? No other procedure has accorded greater relief and comfort. Water in its various forms may be prescribed by the physician to produce a tonic, a constructive, a sedative, and an eliminative effect. The production of a hyperpyrexia by a hot bath is the simplest, most economic and least harmful procedure there has been developed. Under ordinary medical supervision, proper thermocouple control and thermometer recording, artificial hyperpyrexia has demonstrated favorable results in human ills heretofore unresponsive to the best known medical treatment. A specially devised tank or outside pool—under temperature and flow control—for the treatment of anterior poliomyelitis patients in the post-paralytic stage is another method by which reconstruction to the maximum degree is accomplished. Buoyancy of the water in the tank overcomes the effect of gravity, permitting movement with least strain on the relaxed joints. Another phase of physical therapy too often neglected or unrecognized, although it is the culmination of effort, the goal towards which the physician directing the physical treatments is aiming, is restoration of function.

Therapeutic exercise has an important part in the scheme of physical therapy. Its virtues have long been overshadowed by less efficient but more spectacular measures. Its rationale is very flexible. One can introduce exercise therapy in the form of assistive, mechanical, educative, which will bring about normal function from disfunction. There must be a director, "a trainer" if you like, who recognizes or can understand the physical therapy prescription to accomplish this end. This is the most difficult phase of the "curative" work. It demands a knowledge of the action of muscles, mechanics, orthopedics (working knowledge of physiology, anatomy and pathology) and habitual bodily carriage and posture. To employ intelligently the indicated physical agent to bring about the end result is the ideal sought and the standard maintained by the physician in charge of the real physical therapy department.

An adequate physical therapeutic service in a hospital should have a central plant and should function in intimate relationship to the various branches of medicine, surgery and allied specialties. The surgeon should have a high frequency machine at his disposal whenever the need arises for its employment in the operating room. The same is true for the dermatologist and other specialists. Even if this were not possible, appropriate terminals for obtaining the necessary electric current should be available. The main department should handle referred patients with a diagnosis and suggestion for desired treatment.

The first essential in furnishing efficient physical therapy service is to have a physician in charge as director of physical therapeutics. He should have a special knowledge of the value of the application of the various physi-

cal agents—excluding x-ray and radium—and the effects on the human body. He should teach and advise concerning this subject; evaluate the usefulness of the numerous and complex apparati flooding the market; encourage scientific research, both carrying on such work under his supervision or making available such equipment with assistance to any member of the hospital staff; solving the effect of a certain physical procedure on a certain disease. He should give of his expert knowledge freely in consultation with the hospital physicians or to those physicians desiring information within his field. If the hospital can not employ a competent director of physical therapy, an adequately trained technician with executive ability may supervise such a department, but all patients should be referred with the physician's prescription of the exact physical therapy treatment. It is not justifiable to shove the responsibility upon the technician. Hospital administrators would do well to consult a physician qualified to advise in this branch of medical treatment in planning such a service or purchasing physical therapy equipment. Architects do not comprehend the medical viewpoint, nor are business representatives qualified by special experience to purchase apparatus. Too many departments are poorly arranged for efficient work. Too much useless equipment has been brought into the hospital as a result of this and are now occupying valuable space in the store room or carried away as junk. These facts are familiar to everyone. No one has a right to pass judgment of the value of physical therapy based upon incompetent and ignorant service. It should be given that "sporting chance" to prove its value by the complete co-operation of all concerned.

The educational importance of an adequately equipped physical therapy department in a hospital, under competent medical supervision, cannot be ignored. In the well run private hospital with the most useful facilities, the physician knows that his patient will receive the physical therapy treatment prescribed under medical supervision. It will be carefully administered and should therefore materially assist him in the treatment he is desirous to give his patient. Naturally he will place his patients in this hospital and refer his ambulatory patients to this physical therapy department. Thus the patient is satisfactorily treated, the physician is satisfied, he is able to "put over" his method of treatment and the hospital has gained in popularity and income.

In the small hospital, the furnishing of rational physical therapy is a real community service. To the physician who can't afford to install the equipment, it gives him the needed assistance so helpful in his practice. In such hospitals it is easier to have a blood count or a radiograph than a properly administered physical therapy treatment. To the people, the hospital would be truly a health center.

In the city or county hospital where political influence predominates the administrator holds the key to the situation. Does he manage to have on the physical therapy staff physicians who are decidedly interested in promulgating the best physical therapeutics, who are progressive, who will advise, direct and supervise adequately trained technicians in the administering of the numerous treatments to the thousands of patients? Will he select the equipment with which the best results are obtained or will he allow to be purchased inferior type apparatus as a favor to a certain business interest? Here is an opportunity for the hospital administrator.

The greatest responsibility in educational progress in physical therapy rests on every teaching hospital. How many of the medical administrators here present received training in physical therapeutics in their undergraduate medical course? How have you acquired your knowledge? Since the establishment of the Council of Physical Therapy there has been a noticeable decrease in the commercial educational propaganda and a marked increase in teaching within the medical profession. The value and use of physical therapeutics can best be understood by the medical student, the clinician who has occasion to refer patients, and the physician who appreciates the need of a proper technic and equipment in the administration of these treatments only in an adequate Physical Therapy Department in a hospital. Technicians can best be efficiently trained to administer physical therapy treatment only under medical supervision in a qualified Physical Therapy Department in a hospital.

A well equipped physical therapy department will have a competent physician in charge. The equipment will be the most up to date, the technician will be not only capable of administering treatment but will com-

prehend its nature and be capable of evaluating the results to be obtained. Suitable records will be kept so that results may be of real scientific value and show an accurate record of each treatment.

In the treatment of medical and surgical industrial patients, both hospital and ambulatory, physical therapy is often indicated and much employed. In this class of patients, the social and economic factors are of so serious a consideration that the hospital superintendent must make the necessary effort to furnish adequate service. The patient's physician knows good service, and if he does not he learns by the results obtained and that hospital gains or loses accordingly. Who among you would not be gratified if a medical director of an insurance company told you that you had assisted materially in rehabilitating a certain badly injured patient in a shorter period of disability and at much less expense than usually expected? Wouldn't you answer, "That is the kind of hospital service we desire to give you?"

The hospital serves the community through its medical staff. The hospital must furnish facilities to its medical and surgical staff, or the regular licensed physicians of the community which will best care for the health of the people.

Radiology — Its Progress and Future

It may be presumptuous to anticipate the future, but I look forward to the day—and I think it is coming soon—when every radiologist who has cases to treat will have charge of beds in the hospital. For the benefit of the patient and for the true advancement of radiology this is a necessity. It is only at the bedside that many things become plain, and it is by accurate daily observation of cases under treatment that new facts are discovered leading to true advancement. Opposition we must expect, especially from those who dwell in the backwaters of medicine. They have to be suffered but there is no need to suffer them gladly. On the other hand, the leaders of the medical profession have at all times welcomed advances in radiology, and on many occasions have stretched forth a helping hand. Quite recently I had a letter from one of the most distinguished physicians of the present day, who had just returned from a visit to many hospitals and medical centres abroad. He was impressed by the extreme efficiency of the radiological departments, and says without hesitation that, with certain exceptions, Great Britain is behind France, Germany, Holland, Denmark, Sweden and America, in radiology. He stresses the importance of radiology in medicine and surgery, and contrasts the status of the radiologist abroad with that accorded him here. It is gratifying to relate that his considered opinion now is that the radiologist is entitled to take his place with the physician and surgeon on terms of equality. This is what we are striving for . . . .

I look forward, then, to the time when all apparatus will be shock-proof and more or less standardized so as to reduce costs, which at the present time are so great that they constitute a serious problem, not only for hospitals, but for the radiologist in private practice; to the establishment of radiological institutes in association with all teaching hospitals, in which the physicist and radiologist will work together and in which research work will be carried out; to the development of the teaching of radiology, not only to post-graduates but to undergraduates, bearing in mind its close relationship with applied physiology, anatomy and pathology.—J. M. Woodburn Morison, Presidential Address, Section of Electro-Therapeutics, Royal Society of Medicine (October 17, 1930.) *British Jour. Radiology*, 4:100 (March) 1931.

THE TONSILLECTOMY PROBLEM — SOME COMPARISONS

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Tonsillectomy is by far the most commonly performed of all surgical operations today. It is estimated that over forty per cent of surgical operations are for removal of the tonsils. The operation is performed by the laryngologist, by the general surgeon, and by the general practitioner. Outside of the larger cities, perhaps, it is safe to assert that more tonsil operations are performed by the general surgeon and general practitioner than by the throat specialist. It is unfortunate that the laity in general, and a great many physicians also, regard the tonsil operation as one of comparative simplicity and minor import. It is true that many tonsil operations are comparatively easy even in the hands of the operator of very moderate skill and experience; but it is also true that many are very difficult of successful performance by the trained throat surgeon; and some of the complications met with—especially hemorrhage—may render the operation even dangerous to life.

The difficulty is not so much with the operators as it is with the operative technics. Snare and dissection; Sluder; suction tonsillectomy; and tonsillar electrocoagulation, are the chief technics in use today for removal of the pathologic tonsil. Snare and dissection removal of the tonsil in its many modifications, is undoubtedly the technic employed today by the great majority of operators. This is not necessarily because they find it perfectly satisfactory, but mainly for the reason that it is the only technic with which they are familiar. It is the technic they have observed during their hospital service. The hundreds of tonsil instruments for dissection illustrated in the various surgical catalogs offer evidence of efforts to lessen or to obviate the difficulties encountered in the surgical removal of tonsils by dissection. And these difficulties are quite real.

Novak says this:

> "In seeking for a new method for the removal of tonsils it is well to pause and ask the question, 'What is wrong with the old method?'
>
> "By 'Old Method' we mean the removal by dissection and the use of a snare, or the use of some form of a tonsillectome.
>
> "The difficulties of the operation may be classified in the following manner:
>
> "1. Hemorrhage (primary).
>
> "2. Pain or great discomfort.
>
> "3. Difficulty in the enucleation, due to previous peritonsillar abscess or chronic peritonsillitis or to:
>
> "a. Malposition of the styloid process, or
>
> "b. Calcareous or cartilaginous inclusions within the tonsil.
>
> "4. Complications:
>
> "a. Secondary hemorrhage.
>
> "b. Trauma to pillars.
>
> "c. Inadvertent uvulectomy.
>
> "d. Distortion and immobilization of the soft palate.
>
> "e. Lung abscess.
>
> "5. Economic considerations:
>
> "a. Expense of hospitalization.
>
> "b. Relatively long period of disability.
>
> "It is probable that no clinician of experience will deny the validity of the drawbacks of tonsillectomy as listed above.
>
> "He may question whether the fault lies invariably in the method, or whether the element of skill, adequate training, knowledge on the part of the operator does not play an important rôle.
>
> "It is a notorious fact that there are medical men who claim no surgical qualifications whatever, yet who do not hesitate to DO a tonsillectomy."

This last assertion is perfectly true; because men who would not dare attempt a cataract extraction or an appendectomy, do not hesitate a moment to do a tonsil operation. Yet many a cataract extraction or appendix removal offers a far easier and safer problem than some tonsillectomies.

It may again be emphasized, however, that the major difficulty is not so much with the operators as with the present-day operative technics. That this difficulty is real and not merely apparent is mutely revealed by statistics showing that approximately three out of every four surgical tonsillectomies today show imperfection in one way or another, when the throats are carefully examined some months after operation.

The chief advantage of snare and dissection technic is that it is at least applicable in a measure to any and to all types of tonsils; and may be employed for general an-

esthesia, and, in many instances, far less satisfactorily, with local anesthesia. It is difficult to perform a tonsillectomy by any method in the average child under 14 years of age without a general anesthetic; and some few nervous and uncontrollable adults will require a general anesthetic at any age. However, it does seem that with suitable technic available today for a simple, rapid, practically bloodless, local anesthesia tonsillectomy, there is no justification in the average adult case for any operator to subject his patient to the greatly augmented discomforts and dangers of the general anesthetic operation. It is a fact, however, that a great many tonsil operators uniformly insist upon a general anesthesia hospital operation for all tonsil patients, adult as well as child. And again, the comparatively few who essay local anesthesia snare and dissection tonsillectomy, so fully reinforce their local anesthesia with some morphin-hyoscin combination that it is more of a narcothesia operation than a local anesthetic operation. It is a question whether the nausea and vomiting from ether anesthesia is much worse than the nausea and vomiting so common after morphin exhibition; neither of which affords much patient post-operative comfort, or safeguards against post-tonsillectomy bleeding.

Dr. William Campbell frankly tells us that this insistence upon general anesthesia for adult tonsil patients is not so much for ease and comfort and general well being of the patient, as it is for the operator:

> "I think the outstanding advantage of general anesthesia is the convenience of the operator.
>
> "Where bleeding may be expected or where you have an excessive amount of fibrous tissue, from repeated peritonsillar abscesses, I feel that general anesthesia is easier on the patient and certainly I do not know of anything more trying than a tonsillectomy under local anesthesia on a panicky patient."
>
> "Hemorrhage, primary and secondary, is unpredictable, and occurs frequently," comments Novak.

This is certainly undeniable with dissection technic, as it is with the so-called sharp Sluder; and unless the patient is iron-nerved or fully narcotized, it is impossible to expect the average adult tonsil patient to sit upright or slumped down in an operating chair "under local anesthesia" with mouth wide open and the anxious operator and his assistants and nurses groping in the blood-filled pharynx for from a half hour to an hour or more, blindly trying to get through in good order a "dissection" of perhaps deeply submerged and adherent tonsils, where the "line of cleavage" if any, has long since become purely theoretical. Perhaps after the "dissection" has been completed with the operator anxiously hoping the end-result is a good, clean job; more time has to be taken with location of one or more bleeding points and application of sutures or ligature for control. With the potentially "panicky" patient under general anesthesia, the operator can better take his time with operative and hemostatic efforts; but it cannot be argued that the more prolonged general anesthesia does the patient more good from a standpoint of general physical balance. Further than this, the patient may be returned to bed with a dry throat and in good condition; but this is no guarantee that retching and vomiting will not bring on further bleeding with necessity for still more hemostatic effort. Perhaps this delayed primary bleeding may not develop for several hours until the patient is well out from the anesthetic. If further suturing is required for control of bleeding, this means usually more general anesthetic. All in all, the picture is often anything but pleasant for the patient; and very, very trying for the operator.

It may be argued that bleeding and other complications do not happen in the practice of the trained operator; that it is only the unskilled and inexperienced operator who has post-tonsillectomy complications. Just as rain falls upon the Just as well as the Unjust, so hemorrhage occurs quite frequently in the practice of the skilled tonsil dissection operator as well as in that of the operator of more moderate skill and training. Control, of course, is usually easier the better trained and experienced the operator.

Primarily again, however, the fault lies with the operation and not so much with the operator.

Neivert, a sharp dissection operator of considerable experience, says this of dissection:

> "Our greatest difficulty is with tonsils bound down by scars and adhesions. Here a little patience and a sharp knife cutting close to capsule will keep us from buttonholing the pillars and pulling away chunks of muscle which cause excessive bleeding, possible infection and subsequent scarring.
> * * *

"How to make sure that one is in the proper line of cleavage is at times difficult. * * * Small tabs of tonsil or capsule with tonsil-bearing cells must not remain. "* * * Taking off the pillars or uvula is scarcely excusable. * * *

"Perhaps the thing that worries us most is the bleeding."

To examine the beautiful cuts employed in present-day works on tonsil surgery, one might imagine that the broad highway of the tonsillar region was perfectly sign-posted and traffic-light controlled. That all the operator had to do was to follow the black line or the yellow line or the green line for subway traffic guidance and all would be well. Just follow that mystic "line of cleavage" between the tonsil capsule, if any, and the aponeurosis covering the constrictor, and all is well. Unfortunately, it is just in these small, badly adherent, deeply submerged, and chronically inflamed tonsils of adult life, that the dissection operator encounters his most trying times. Dense adhesions and frequently free bleeding stirred up by efforts to "hew to the line" with a sharp scalpel render dissection not only a matter of extreme difficulty and time consuming efforts; but in many cases makes it a simple impossibility to effect a clean enucleation.

The blunt dissection operator is in no better case on this type of tonsil; instead of cutting the tonsil loose with his sharp scalpel, he simply "blunt dissects"; which often is merely another way of saying he pulls and tears the tonsil proper away from the densely adherent underlying fascia. Neither sharp dissection nor blunt dissection are entirely satisfactory on these badly adherent tonsils; often very, very unsatisfactory to all concerned.

Jacobs and Trauner paint the dissection picture admirably:

"Theoretically, tonsillectomy by preliminary dissection aims to remove the entire tonsil intact with the least amount of hemorrhage.

"This it often fails to do.

"The capsule is often so intimately adherent to the underlying aponeurosis that it is impossible to separate the two by means of a knife.

"What usually results is that the knife gets into the fascia back of the capsule and opens many bleeders, or else it gets back into the tonsil tissue proper, so that the fibrous capsule is left in the fossa."

The Sluder tonsillectomy developed by the late Greenfield Sluder about two decades ago, was justly heralded as a wonderful advance in tonsil surgery; the dawn of a new day—complete, in-capsule removal of the faucial tonsil where before the old, incomplete, generally unsatisfactory tonsillotomy held wide sway. Enthusiasm for the Sluder technic was spontaneous and widespread; and operators journeyed from far and near for instruction and personal study in the Sluder clinic. Every tonsil operator in any way progressive bought himself a Sluder tonsillotome. In hands of Sluder the operation was highly spectacular and employed on any and all types of tonsils; but it was and is a technic of inherent difficulty; so much so that Sluder is quoted as having performed his operation a thousand times before mastery was attained. Many Sluder disciples became quite proficient in the technic; but gradually certain inadequacies began to be realized, and many attempts were made to modify the original Sluder instrument into one of more efficiency and less difficulty. Basic difficulty of the technic remained unchanged and unchangeable. The operation was not well adapted to local anesthesia operation; and gradually many Sluder operators routinely insisted upon general anesthesia for all tonsil cases. Further it was found that the average operator simply could not "get" satisfactorily a good many of the small, flat, submerged and badly adherent tonsils so often encountered in the adult, with a history of repeated tonsillitis or perintonsillar abscess attacks. Experience quickly taught the Sluder operator the type of tonsil to attack with Sluder technic; after slicing some tonsils and then having to dissect the adherent bases; or buttonholing or completely shaving off a few pillars, it was found more satisfactory to "dissect" under general anesthesia all tonsils likely to offer difficulty to Sluder attack. The result of this situation is that the Sluder operation has been slowly losing ground, and more and more Sluder operators have turned back to routine dissection of all tonsils under general anesthesia.

Tonsillar electrocoagulation has created quite a wave of enthusiasm over the country in the past few years; by some operators enthusiastically praised as "the last word" in tonsillectomy technic, and by others just as heartily condemned. For operators grown weary with repeated dissection difficulties; hemostatic efforts required almost routinely,

and fairly common incomplete or imperfect post-operative results, electrocoagulation has seemed ideal for the adult tonsil patient. No bleeding; no cutting; no hospitalization; no apparent difficulties or dangers; an "office" operation, from which the patient steps forth after treatment to resume his or her daily routine without interruption. This means much to the patient, especially as concerns its "bloodless" nature, its saving of hospital bills, and more especially, the fact that no time is lost from daily avocation.

There is no question that tonsillar electrocoagulation is a valuable addition to our tonsillectomy armamentarium, and for properly selected cases the competent and efficient tonsil operator should be qualified to offer his patients their choice of surgical removal or of electrocoagulation removal of tonsils. Tonsillar electrocoagulation is impracticable in children without a general anesthetic; although many operators may challenge this statement. As a rule the multiple-stage treatment by coagulation may be employed satisfactorily in the great majority of adult patients, with no more local preparation than throat spray with a suitable local anesthetic such as 2 per cent Nupercaine-epinephrin. From five to six treatments for each tonsil a week apart is about the average requirement. From an economic standpoint, strong appeal to the patient is carried by the fact that it is an "office" treatment without the often heavy expense of hospitalization, and also that no time is lost from usual avocation. From the physician's economic standpoint, it is of value because little time is required for treatment after operation, because the treatment can be given in the office and because the physician is more likely to receive full remuneration. Often by the time many patients have paid their hospital bills, they are financially depleted to an extent which means a long wait for payment of the physician's bill. This is a matter of importance, because statistics on this situation in large cities show that from three to five per cent of hospitalized patients pay their hospital bills promptly, but never quite get around to payment of the physician. One disadvantage of electrosurgical removal of tonsils is the greater consumption of the physician's time and attention with the multiple treatments. Almost as much time is consumed in preparation of throat for a coagulation treatment as for actual surgical pre-operative local anesthetization, and when this time and effort is multiplied some ten or twelve times, plus the time consumed in getting each patient into and out of the treatment room, the item is important from an efficiency standpoint. Not that this greater time consumption is an argument against coagulation removal of tonsils, but it is of importance in conservation of the busy operator's time and energy. Many patients, who require tonsillectomy but who resolutely refuse surgical tonsillectomy, will readily acquiesce in a coagulation removal when the method is explained to them.

Electrocoagulation is unquestionably the method of choice in the aged and comparatively debilitated, in the hemophiliac, and where there is the slightest question of malignancy about a tonsil. It requires not only a perfect working knowledge of surgical anatomy of the tonsillar region, but also of tonsillectomy technic. Further than this it requires proper equipment and perfected electrosurgical technic. Hundreds of physicians today are doing themselves and their patients untold damage by rushing enthusiastically into tonsil electrocoagulation without proper training and experience to guide them. Likewise a valuable addition to our armamentarium is being harmed by its attempted usage by untrained operators guided more by the valor of ignorance than the discretion and conservatism of knowledge. There is no question that electrocoagulation is a valuable addition to our resources in dealing with the pathologic tonsil, and the operator who has at his command perfected surgical technic as well as electrosurgical, for such cases as may be indicated, can render better service.

Suction tonsillectomy was developed several years back in an effort to develop an operation that would be applicable to any and all types of tonsils; that would be just as satisfactory for local as for general anesthesia operation, and which would eliminate insofar as possible the undeniable difficulties, deficiencies and dangers of the older dissection and Sluder technics. This it does beyond any question, but it requires perfect equipment and technic for entire success. Invariably operators who have attempted the new operation and failed to achieve satisfactory results, have been operators who attempted it with faulty equipment or faulty technic. Then instead of blaming themselves they

blame the operation, in an attempted defense reaction. There is always a certain degree of psychological resistance on the part of all of us towards new developments. Operators who have never seen the suction operation and so have no direct personal knowledge pro or con, stubbornly refuse the opportunity to see the proper equipment and perfect technic as though one glance would automatically force them to discard their Sluder or their dissection. There is this danger, for as one convert exclaims:

> "I cannot for the life of me see how any operator could use any other method of tonsil removal after he once saw this."

In the suction operation, the principle of suction obtained from an electrically-driven and foot-switch controlled compressed air and suction pump, is employed through a tonsil suction tube of special design to lift the tonsil from its fossa by suction, whereupon a previously adjusted tonsil snare loop is carried rapidly over end of tonsil tube, automatically slips over end of tube and on to base of tonsil as it is tightened, and by ratchet employment slowly or rapidly enucleates the tonsil in a clean, practically bloodless manner, and this without damage to uvula, pillars, or underlying throat structures. Compared to the usual tonsil enucleation, the operation is so rapid as to seem almost automatic; not that rapidity of enucleation is our goal, but where rapidity of enucleation may be obtained with perfection of enucleation, it is obviously a very desirable feature. In the vast majority of cases, the operation is bloodless for all practical intents and purposes. Not that bleeding will never be encountered, but rarely of any moment, and as a rule controlled with ease and dispatch. Because of its ease, rapidity and practical absence of hemorrhage or other serious complication, suction tonsillectomy may be performed in the well equipped office with the utmost satisfaction to all concerned, and hospitalization is not required. This is an economic factor carrying strong appeal to the patient, and means that the suction tonsillectomy operator receives payment for his services, where all too often the hospitalized tonsil patient pays the hospital bill and allows the operator to go without.

The operation owes its practically bloodless nature to two factors. One is that the heavy No. 9 tonsil snare wire loop is tightened down comparatively slowly by employment of a ratchet type snare such as the Pierce-Mueller, and thereby the dull wire pinches or crushes through the small capillary twigs going into the tonsil proper and seals them. A more important factor, however, is that no sharp-edged instrument is employed as in dissection.

Jacobs and Trauner explain this nicely:

> (Speaking of dissection) "The capsule is often so intimately adherent to the underlying aponeurosis that it is impossible to separate the two by means of a knife.
>
> "What usually results is that the knife gets into the fascia back of the capsule and opens many bleeders. * * *
>
> "With the suction method, however, there is no possibility of getting into the tonsil tissue as the capsule is drawn up into the tube. As for opening bleeders, this is a rare complication, as the snare wire cannot enter the aponeurosis. If, as is sometimes the case, the vessels lie superficial their outer advential coast may be scraped. We have exposed superficial small vessels lying at the base of the fossa, from which the capsule had been peeled, but they had not been damaged. Had dissection been used in these cases, hemorrhage would have been inevitable."

The operation is ideally adapted to local anesthesia operation in the adult. These patients are not in fear of hemorrhage because they have usually heard of many other suction tonsillectomy patients who "never bled a drop," etc. Then too, the operation is so rapid there is no physical strain or exhaustion. Phenobarbital as a mild preliminary sedative; a throat spray of 2 per cent Nupercaine-epinephrin plus peritonsillar injection of the local anesthetic, and these patients are ready. The operation has been quickly described to them in advance so they know exactly how it goes. The tonsils are removed in from ten to fifteen seconds actual operative time as an average; without pain; without fright; without hemorrhage; without anything untoward except a few seconds discomfort at the most. It is no wonder these patients all get along nicely; have a minimum of post-operative pain and discomfort, and convalesce in about half the usual time. There is no lung abscess after suction tonsillectomy, because the tonsil is immediately vacuum-cleaned of all pus and gross masses of crypt exudate as soon as suction grasp of the tonsil is made.

The operator does not have to worry as to whether or not his tonsil is completely re-

moved; an unbroken capsule shows at once that the tonsil is completely and cleanly enucleated. The fossa is usually dry as a bone inside of a minute. Examination of the fossa with a tonsilloscopic tongue degressor quickly locates any possible oozing point and compression of this with a Herbert tonsil hemostat is all that is required, and even this in but a few instances. Suture or ligature control of bleeding is almost unknown in proper suction tonsillectomy work. Put these patients to bed with a dry throat, and they usually stay dry. Secondary hemorrhage is even rarer.

One great advantage of the operation is that it is equally applicable to any and to all types of tonsils. Its great superiority is immediately manifest upon small, buried and deeply adherent tonsils; just the type that the Sluder operator cannot successfully attack with his Sluder instrument; and which usually mean a tedious, bloody dissection when attempt is made to free such tonsils with the sharp scalpel. Tonsils that are easy with Sluder or with dissection are so ridiculously easy with the suction technic that it might seem they should be reserved for the novice to practice upon.

The impression should not be gained, however, that the technic is so simple and easy as to be almost automatic. Perfect equipment and perfect technic are an absolute essential for perfect operation on all types of tonsils. Efforts at spectacular rapidity or careless technic on easy tonsils, are certain to result in difficulty on some of the badly adherent, submerged tonsils; often coming in with a history of repeated perintonsillar abscess attack. The only safe course is to undertake each enucleation with the impression that it may be a very, very difficult case if not carefully handled.

General anesthesia operation technic is practically identical with that of local, except for supine position of patient on operating table; mouth gag employment, and suction cleansure of the pharynx from time to time as indicated. So rapid is the operation that only a comparatively brief, light etherization is required; in fact, where conditions indicate, the operator may give his own anesthetic with this outfit, and perform his tonsillectomy perfectly with no assistance except perhaps a lay one to hold the head steady in position. Even this assistant could be eliminated, if required, by sandbags to steady position of head on table. This brief anesthetic period naturally means an easier recovery by the little patients, many of whom are playing around the next day with rarely any reference to their throats being sore.

In conclusion let it be emphasized that the suction technic is not the only method of tonsil enucleation. With proper equipment and technic it simply means an easier, cleaner, more efficient tonsillectomy on all types of tonsils than is possible with any of the older technics. Because of its comparatively bloodless type, and absence of complications, it is unquestionably safer.

Absence of complications, elimination of hospitalization necessity, and shortened convalescence period are factors of much economic importance to all concerned.

A recent writer on tonsil surgery states that our goal should be to

> "Make the (tonsil) Operation Safer and Less Tiresome for the Patient and Easier and More Satisfying to the Operator."

On such a basis superiority of the Suction Technic on any and all types of tonsils, and under general or under local anesthesia, must be unchallengeable. It does everything the older operations do, and accomplishes this with far greater ease, rapidity and safety, and EFFIENCY. As one operator enthusiastically comments:

> "It has the old operations all beat to a standstill."

7 E. McMillan Street,

References

1. Novak, Frank J., Jr.: "The Present Status of the Electrocoagulation of Tonsils." *Archives of Physical Therapy, X-Ray, Radium.* April, 1931.

2. Campbell, William: "Advantages of General Anesthesia in Tonsillectomy." *Journal Medical Society of New Jersey.* January, 1931.

3. Neivert, Harry: "The Pitfalls of Local Tonsillectomy." *The Laryngoscope.* March, 1931.

4. Jacobs, S. Nicholas, and Trauner, Lawrence M.: "Suction Tonsillectomy," Waring Method: *The Laryngoscope.* June, 1930.

5. Waring, J. B. H.: "A Few Kind Words for Tonsillar Electrocoagulation." *Eye, Ear, Nose and Throat Monthly.* May, 1931.

6. Waring, J. B. H.: "Suction Tonsillectomy." *Archives of Otolaryngology.* July, 1930.

7. Waring, J. B. H.: "A Plea for Local Anesthesia Tonsillectomy." *Eye, Ear, Nose and Throat Monthly.* February, 1930.

8. Vail, Harris H.: "Tracheobronchial Tree in Children." *Arch. Otolaryngology.* July, 1928.

DETAILED PROGRAM
TENTH ANNUAL SESSION
American Congress of Physical Therapy
OCTOBER 5, 6, 7, 8, 1931
HOTEL FONTENELLE
OMAHA, NEBRASKA

RULES GOVERNING THE READING OF PAPERS AND DISCUSSIONS

No address or paper before the Congress shall occupy more than twenty minutes in its delivery (addresses of specially invited guests excepted) and no member shall speak more than five minutes or more than one time on any one subject, provided each essayist be allowed ten minutes in which to close the discussion. This rule must be strictly adhered to.

All papers read before the Congress shall be the property of the Congress for publication in the official journal. Each paper shall be deposited with the Secretary when read.

No paper shall be published except upon recommendation of the Publication Committee, which shall consist of the Editor as Chairman and other duly appointed members of the Congress.

The General Headquarters of the Clinical Congress of Physical Therapy will be located at the Hotel Fontenelle, where all matters pertaining to the meeting will be cared for.

The information bureau and congress postoffice are in connection with the registration bureau.

Suggested Advice to Members of the Organization Respecting Reduction Authorized on the Certificate Plan for Benefit of Members and Dependent Members of Their Families

A reduction of one and one-half fare on the "Certificate Plan" will apply for members and dependent members of their families attending the meeting of

AMERICAN CONGRESS OF PHYSICAL THERAPY

to be held at Hotel Fontenelle, October 5, 6, 7, 8, 1931.

The following directions are submitted for your guidance:

1. Tickets at the regular one-way tariff fare for the going journey may be obtained on any of the following dates (but not on any other date) October 5-8, inclusive. Be sure that, when purchasing your going ticket, you request a "CERTIFICATE." *Do not make the mistake of asking for a "receipt."*

2. Present yourself at the railroad station for ticket and certificate at least thirty minutes before departure of train on which you will begin your journey.

3. *Certificates are not kept at all stations.* If you inquire at your home station, you can ascertain whether certificates and through tickets can be obtained to place of meeting. If not obtainable at your home station, the agent will inform you at which station they can be obtained. You can in such case, purchase a local ticket to the station which has certificates in stock, and from there you can buy a through ticket to place of meeting and at the same time ask for and obtain a *"Certificate Plan" certificate.*

4. Immediately on your arrival at the meeting, present your certificate to the endorsing officer, A. R. Hollender, Chairman, as the reduced fare for the return journey will not apply unless the certificate is properly endorsed by him and validated by a railroad Special Agent as provided for by the certificate.

5. Arrangements have been made for validation of certificates by a Special Agent of the carriers on October 5-8, inclusive provided the required minimum of 150 certificates is presented.

6. *No refund of fare will be made because of failure to obtain a proper certificate when purchasing going ticket.*

7. To prevent disappointment, it should be understood that the reduction on the return journey is not guaranteed, but is contingent on an attendance at the meeting, of not less than 150 members of the organization and dependent members of their families, holding regularly issued certificates obtained from ticket agents at starting points, each showing payment of regular one-way adult tariff fare of 67 cents or more on going journey.

8. If the necessary minimum of 150 certificates is presented at the meeting and your certificate is duly validated by the Special Agent, you will be entitled to purchase a return ticket via the same route over which you made the going journey at one-half of the regular one-way tariff fare from the place of meeting to the point at which your certificate was issued.

9. Return ticket issued at the reduced fare will not be good on any limited train on which such reduced fare transportation is not honored.

The above arrangements will in all probability apply to the following passenger associations, several of which have already granted our application for excursion fares.

1. Central Passenger Association.
2. Trunk Line Association.
3. New England Passenger Association.
4. Southeastern Passenger Association.
5. Western Passenger Association.
6. Southwestern Passenger Association.
7. Trans-continental Passenger Association.
8. Canadian Passenger Association (Eastern Lines).

IMPORTANT NOTICE

As the railroads have reduced the required number of certificates to 150, the reduced fare on the Certificate Plan is practically assured this year. BE SURE TO OBTAIN A RAILROAD CERTIFICATE.

THE HOTEL FONTENELLE has been selected as the official headquarters for the Ninth Annual Convention of the American Congress of Physical Therapy.

There will be excellent accommodations for all who attend the sessions and room rates will be as closely as possible as requested in reservations.

The splendid exhibition hall, the large section meeting rooms, the popular priced dining rooms, and the constant desire of the hotel management to make everybody comfortable—and the convention a success—speak well for the selection of this hotel for the 1931 headquarters.

Reservations for rooms should be made as early as possible. Write directly to the Hotel Fontenelle, specifying the accommodations you desire. Or reservations may be made by writing to the Executive Secretary of the Congress, Suite 716, 30 North Michigan Avenue, Chicago.

GENERAL INFORMATION

Attention is directed to the scheme of this year's program. The clinics will be conducted in the mornings. Each section has a complete schedule of its own which includes diversified subjects. Practically every specialty is represented. The lecturers have been selected to present their respective subjects because of their special interest and ability gained by mature experience. The large majority is engaged in teaching medical subjects and have shown more than average proficiency in doing so.

As heretofore, the sections will be three in number: MEDICINE, SURGERY, and EYE, EAR, NOSE and THROAT. The scientific sessions will be conducted afternoons. Sectional meetings will be held on Monday, Tuesday, and Wednesday. On Thursday the three sections will meet jointly. The papers are of general interest.

Registration for the sessions should be made by mail prior to the meeting. If this is not done, registration should be completed early Monday morning, October 5, 1931. The registration headquarters will be open at eight o'clock. It is most desirable that registration cards be obtained early as clinics will commence promptly at the time designated on the schedules. Guests of the congress who will participate in the program are exempt from registration fees. Guests are requested to announce themselves at the registration desk as soon as they reach the hotel.

FORMAL OPENING OF SESSIONS

MONDAY EVENING
OCTOBER 5, 1931
7:30 O'CLOCK

BALL ROOM—HOTEL FONTENELLE

1. **Call to Order by President.**
   R. W. FOUTS, M.D.
2. **Invocation.**
   REV. FRANK G. SMITH, D.D.,
   Pastor, Central Congregational Church.
   Omaha.
3. **Address of Welcome.**
   HON. RICHARD L. METCALFE,
   Mayor of the City of Omaha.
4. **Address.**
   HON. THEODORE L. METCALFE,
   Lieutenant Governor, State of Nebraska.
5. **Response.**
   R. W. FOUTS, M.D.,
   President, American Congress of Physical Therapy.
6. **Induction of the President-Elect.**
   F. H. EWERHARDT, M.D.
7. **Physiotherapy and the Physician's Obligations.**
   HAROLD M. F. BEHNEMAN, M.D.,
   Chief of the Dept. of Physical Therapy, University of California Medical School.
   San Francisco.
8. **Call to Order of Business Session.**
   F. H. EWERHARDT, M.D.,
   President.
9. **Smoker and Informal Fellowship Gathering.**

JOINT SCIENTIFIC SESSION AMERICAN CONGRESS OF PHYSICAL THERAPY and the OMAHA DOUGLAS COUNTY MEDICAL SOCIETY

TUESDAY EVENING
OCTOBER 6, 1931
8:00 O'CLOCK
MEDICAL ARTS AUDITORIUM

A. S. Pinto, M.D., President, Omaha-Douglas County Medical Society, Presiding.

Place of Diathermy in the Cancer Problem.
GUSTAV KOLISCHER, M.D.,
Senior Surgeon in Urology, Michael Reese and Mt. Sinai Hospitals.
Chicago.

Discussion: A. H. Estabrook, Ph.D., New York; J. E. Summers, M.D., and G. F. Simanek, M.D., Omaha.

Studies in the Application of Heat Therapy in Pelvic Infections.
G. D. ROYSTON, M.D.,
F. H. EWERHARDT, M.D.,
M. A. ROBLEE, M.D.,
Washington University Medical School.
St. Louis.

Discussion: Disraeli Kobak, M.D., Chicago; E. E. Chaloupka, M.D., and C. W. Pollard, M.D., Omaha.

BANQUET *
Informal

WEDNESDAY EVENING
OCTOBER 7, 1931
7:00 O'CLOCK
BANQUET ROOM—HOTEL FONTENELLE

F. H. Ewerhardt, M.D.
President-Elect, Toastmaster.

A. S. Pinto, M.D.
President, Omaha-Douglas County Medical Society.

Lucien Stark, M.D.
President, Nebraska State Medical Association.

Herman W. von Schulte, M.D.
Dean, Creighton University School of Medicine.

E. G. Johnson, M.D.
President, Nebraska Section, American College of Surgeons.

Adolph Sachs, M.D.
Councillor, Nebraska Section, American College of Physicians.

R. W. Fouts, M.D.
President, American Congress of Physical Therapy and Officers and Ex-Presidents, American Congress of Physical Therapy.

A. F. Tyler, M.D.
Omaha Chairman of Convention Committee.

* The doctors are invited to bring their ladies and guests. The Omaha Committee on Arrangements has promised to provide some interesting entertainment.

SECTION ON
Medicine and Surgery

MONDAY AFTERNOON
OCTOBER 7, 1931
2:00 O'CLOCK

BALL ROOM—HOTEL FONTENELLE
Dr. J. S. Coulter, Section Chairman

The Effect of Ultraviolet on Some Important Biologic Substances: Biologic Process of Detoxication.

VICTOR E. LEVINE, M.D., Ph.D.,
Professor of Biochemistry and Nutrition, Creighton University School of Medicine.
Omaha.

Discussion: Disraeli Kobak, M.D., Chicago; G. J. Warnshuis, M.D., Cedarburg, Wis.

The Therapeutic Effects of Exercise.

ROBERT L. JOHNSTON, M.D.,
Cleveland Clinic Foundation.
Cleveland.

Discussion: F. H. Ewerhardt, M.D., St. Louis; J. H. McCurdy, M.D., Springfield, Mass.

Physical Therapy in Dermatology.

DONALD J. WILSON, M.D.,
Associate Professor of Dermatology, University of Nebraska, College of Medecine.
Omaha.

Discussion: Lynne B. Greene, M.D., Kansas City, Mo.; Alfred Schalek, M.D., Omaha.

Physical Therapy and Traumatic Surgery.

J. E. M. THOMSON, M.D.,
Chief, Department of Orthopedic Surgery, Bryan Memorial Hospital,
Lincoln, Nebraska.

Discussion: F. H. Walke, M.D., Shreveport, La.; J. S. Coulter, M.D., Chicago.

The Effects of Radiant Energy on the Vascularity and the Functions of the Skin.

PAUL ROTH, M.D.,
Battle Creek Sanitarium.
Battle Creek, Michigan.

Discussion: Victor E. Levine, M.D., Ph.D., Omaha; Donald J. Wilson, M.D., Omaha.

Pathological and Diagnostic Aspects of Arthritis.

EARL McBRIDE, M.D., F.A.C.S.,
The Reconstruction Hospital, and McBride Clinic.
Oklahoma City, Oklahoma.

Discussion: W. H. Gardner, M.D., Pittsburgh; W. Scott Keyting, M.D., Salt Lake City, Utah.

Is Physical Therapy Merely an Adjunct to Other Treatment Methods?

O. M. MOORE, M.D.,
York Clinic and Clinic Hospital.
York, Nebraska.

Discussion: W. P. Grimes, M.D., Kansas City, Mo.; Chas. M. Bray, M.D., Morgantown, W. Va.

Physical Therapy in the Treatment of Erysipelas and Kindred Skin Infections.

H. D. HOLMAN, M.D.,
Park Hospital Clinic.
Mason City, Iowa.

Discussion: W. H. Ude, M.D., Minneapolis; J. J. Borghoff, M.D., Omaha.

SECTION ON
Medicine and Surgery

TUESDAY AFTERNOON
OCTOBER 6, 1931
2:00 O'CLOCK

BALL ROOM—HOTEL FONTENELLE
Dr. R. W. Fouts, Section Chairman

A Plea for Better Understanding of Colon Mechanics.

FREDERICK H. MORSE, M.D.,
Author: Galvanism and Sine Current Technique.
Boston.

Discussion: J. W. Wiltsie, M.D., Binghamton, N. Y.; C. L. Rowell, M.D., Chicago.

Bronchial Carcinoma.

A. F. TYLER, M.D.,
Professor of Roentgenology and Physical Therapy, Creighton University, School of Medicine.
Omaha.

Discussion: R. J. Callander, M.D., Tucson, Arizona; John H. Vaughan, M.D., Amarillo, Texas; Benjamin Goldberg, M.D., Chicago.

Clinical Factors Determining the Response of the Patient to Ultraviolet Radiation.

G. J. WARNSHUIS, M.D.,
Former Medical Research Director Burdick Corp.
Cedarburg, Wis.

Discussion: J. S. Hibben, M.D., Pasadena, Cal.; Harold M. F. Behneman, M.D., San Francisco, Cal.

Electrosurgery in Neoplastic Conditions.

F. B. FREELAND, M.D.,
Director of Physical Therapy, Good Samaritan Hospital.
Oregon.

Discussion: F. L. Nelson, M.D., Ottumwa, Ia.; Gustav Kolischer, M.D., Chicago.

On Reducing and Treating Cervical Dislocations.

THEODORE P. BROOKS, M.D.,
and
F. H. EWERHARDT, M.D.,
Washington University School of Medicine.
St. Louis.

Discussion: F. W. Carruthers, M.D., Little Rock, Ark.; J. H. McCurdy, M.D., Springfield, Mass.

The Results of Measurements of Scattered and Secondary Rays Resulting from Various Types of Primary X-rays.

H. B. HUNT, M.D.,
Chairman, Department of Roentgenology, University of Nebraska, College of Medecine.
Omaha.

Discussion: A. Bachem, Ph.D., Chicago; Wilhelm Stenstrom, Ph.D., Minneapolis, Minn.

Bone Cysts (Lantern Slides).

CHARLES L. HUSTEAD, M.D.,
Director of Staff, Falls City Hospital.
Falls City, Nebr.

Discussion: R. W. Fouts, M.D., Omaha; F. W. Carruthers, M.D., Little Rock.

Report of a Case of Ewing's Tumor of the Left Fibula with Metastases in the Lungs and Pleura. Medical, X-ray and Radium Therapy Used.

FRANK CONLIN, M.D.,
Assistant Professor of Medicine, University of Nebraska, College of Medicine.
Omaha.

Discussion: A. Strauss, M.D., Cleveland; W. E. Pennington, M.D., Indianapolis; T. P Brookes, M.D., St. Louis.

SECTION ON
Medicine and Surgery

WEDNESDAY AFTERNOON
OCTOBER 5, 1931
2:00 O'CLOCK

BALL ROOM—HOTEL FONTENELLE
F. H. Walke, M.D., Section Chairman

The Use of Medical Regime and Radium in Preparing Inoperative Thyroid Patients for Operation.

ADOLPH SACHS, M.D.,
Professor of Medicine, Creighton University, School of Medicine.
Omaha.

Discussion: Benjamin Goldberg, M.D., Chicago; Harold Swanberg, M.D., Quincy, Ill.

Psychoneuroses from the Standpoint of Diagnosis and Management as Concerns the Internist.

WILLARD C. STONER, M.D.,
Director of Medicine, St. Luke's Hospital.
Cleveland.

Discussion: C. O. Molander, M.D., Chicago; Raymond L. Traynor, M.D., Omaha; G. H. Croom, M.D., Asheville, N. C.

Established Actinic Therapeutic Modalities in Dermatology.

MOSES SCHOLTZ, M.D.,
Professor of Clinical Dermatology, College of Medical Evangelists.
Los Angeles, Cal.

Discussion: C. C. Tomlinson, M.D., Omaha; A. E. Schiller, M.D., Detroit, Mich.

Treatment of Sciatica by Physical Measures.

NORMAN E. TITUS, M.D.,
Associate in Surgery, Columbia University, College of Physicians and Surgeons.
New York.

Discussion: Frank H. Walke, M.D., Shreveport, La.; Disraeli Kobak, M.D., Chicago.

Postoperative Indications for Diathermia.

JAMES F. KELLY, M.D.,
Associate Professor of Roentgenology and Physical Therapy, Creighton University, School of Medicine.
Omaha.

Discussion: N. E. Titus, M.D., New York; J. S. Coulter, M.D., Chicago.

Routine Postoperative Use of Physical Therapy in General Surgery.

H. C. MILLER, M.D.,
Surgeon to the Immanuel Hospital.
Omaha.

Discussion: B. H. Sherman, M.D., Dexter, Ia.; N. H. Polmer, M.D., New Orleans, La.

The Importance of Static Massage Following Diathermia.

J. E. RUETH, M.D.,
Instructor in Physical Therapy, Marquette University; Director, Department of Physical Therapy, Milwaukee County Hospital.
Milwaukee, Wis.

Discussion: N. E. Titus, M.D., New York; F. H. Morse, M.D., Boston.

Sarcoma of the Uterus; Panhysterectomy; Recurrence; High Voltage X-ray Therapy; Laparotomy; Well Seven and One-Half Years After.

HERBERT H. DAVIS, M.D.,
Assistant Professor of Surgery, University of Nebraska, College of Medicine.
Omaha.

Discussion: Max Thorek, M.D., Chicago: A. Bachem, Ph.D., Chicago.

SECTION ON
Eye, Ear, Nose, Throat, and Oral Surgery

MONDAY AFTERNOON
OCTOBER 5, 1931
2 O'CLOCK

PARLOR B—HOTEL FONTENELLE
F. L. Wahrer, M.D., Section Chairman

Value of Zinc Ionization in Selected Cases of Suppurative Otitis Media.

I. D. WALKER, M.D.,
Tonkawa Hospital,
Tonkawa, Oklahoma.

Discussion: A. R. Hollender, M.D., Chicago; Ellis G. Linn, M.D., Des Moines, Ia.

Radium Therapy: Its Scope in Ophthalmology.

LAURA A. LANE, M.D.,
Assistant Professor of Ophthalmology and Otolaryngology, Medical School, University of Minnesota.
Northfield, Minn.

Discussion: John H. Vaughan, M.D., Amarillo, Texas; Carl B. Sputh, M.D., Indianapolis, Ind.; Chas. M. Swab, M.D., Omaha.

Physical Therapeutic Measures in Some Phases of Otolaryngology.

ELLIS G. LINN, M.D., F.A.C.S.,
Otolaryngologist, Methodist Hospital,
Des Moines, Iowa.

Discussion: J. W. Orr, M.D., Flint, Mich.; A. B. Crites, M.D., Kansas City, Mo.

Cold Quartz Ultraviolet Orificial Irradiation.

O. B. NUGENT, M.D.,
Professor of Ophthalmology, Chicago Eye, Ear, Nose and Throat College.
Chicago.

Discussion: Disraeli Kobak, M.D., Chicago; F. H. Morse, M.D., Boston.

The Removal of Pathological Tissue *en masse* by Insulated Cutting Instruments and the Electrosurgical Snare.

JOSEPH PRENN, M.D.,
Boston.

Discussion: A. F. Tyler, M.D., Omaha; Lewis J. Silvers, M.D., New York.

Epithelioma of the Face Treated by Physical Methods, (Lantern Slides).

H. B. HUNT, M.D.,
Chairman Department of Roentgenology, University of Nebraska, College of Medicine.
Omaha.

Discussion: Harold Swanberg, M.D., Quincy, Illinois; E. R. Van Meter, M.D., St. Louis; Earl C. Padgett, M.D., Kansas City, Mo.

SECTION ON
Eye, Ear, Nose, Throat, and Oral Surgery

TUESDAY AFTERNOON
OCTOBER 6, 1931
2:00 O'CLOCK

PARLOR B—HOTEL FONTENELLE
Dr. O. B. Nugent, Section Chairman

The Audiometer as an Aid in the Diagnosis of Impaired Hearing.

G. HENRY MUNDT, M.D.,
Chicago.

Discussion: O. B. Nugent, M.D., Chicago; Ferris Smith, M.D., Grand Rapids, Mich.

Aids for the Hard of Hearing.

HORACE NEWHART, M.D.,
Professor of Otolaryngology, University of Minnesota Medical School.
Minneapolis, Minn.

Discussion: John C. Davis, M.D., Omaha; Lewis J. Silvers, M.D., New York.

The Efficient Management of Chronic Sinus Disease.

FERRIS SMITH, M.D.,
Head and Neck Surgeon, Blodgett Memorial Hospital.
Grand Rapids, Mich.

Discussion: B. M. Kully, M.D., Omaha; A. R. Hollender, M.D., Chicago; W. F. Callfas, M.D., Omaha.

Electrosurgery in Rhinolaryngology.

LEWIS J. SILVERS, M.D.,
Associate Otolaryngologist, Ocean Hill Memorial Hospital.
New York.

Tonsillectomy by Electrocoagulation.

GREGG A. DILLINGER, M.D.,
Pittsburgh.

Surgery and Electrosurgery as Related to the Tonsil Problem.

FREDERICK B. BALMER, M.D.,
Dept. of Otolaryngology, Northwestern University Medical School,
Chicago.

Discussion of the foregoing papers: W. A. Cassidy, M.D., Omaha; F. L. Wahrer, M.D., Marshalltown, Ia.; Philip Romonek, M.D., Omaha; J. B. H. Waring, M.D., Cincinnati.

The Maxillary Sinus.

W. L. SHEARER, M.D.,
Professor of Oral Surgery, University of Nebraska, College of Medicine.
Omaha.

Discussion: E. Lloyd Jones, M.D., Wheeling, West Virginia; O. H. Homme, M.D., Los Angeles, Cal.

SECTION ON
Eye, Ear, Nose, Throat, and Oral Surgery

WEDNESDAY AFTERNOON
OCTOBER 7, 1931
2:00 O'CLOCK

PARLOR B — HOTEL FONTENELLE
Dr. Carl B. Sputh, M.D., Section Chairman

Physical Therapy in Otolaryngology.

GEORGE B. RICE, M.D., F.A.C.S.,
Emeritus Professor of Rhinology and Laryngology, Boston University School of Medicine. Consultant, Diseases of the Nose and Throat, Massachusetts Memorial Hospitals.

Title to be announced.

L. L. DOANE, M.D., F.A.C.S.
Butler, Pa.

Discussion: Wm. Rohrbacher, M.D., Iowa City, Ia.

Ultraviolet in the Practice of Stomatology.

A. T. RASMUSSEN, D.D.S.,
St. Francis Hospital.
La Crosse, Wis.

Discussion: C. E. Norris, D.D.S., Indianapolis, Ind.; C. B. Holman, D.D.S., St. Louis; G. H. Fritz, D.D.S., Omaha.

Ultraviolet Irradiation in the Treatment of Vincent's Angina.

WM. ROHRBACHER, M.D.,
Rohrbacher Sanitarium.
Iowa City, Iowa.

Discussion: Samuel D. Maiden, M.D., Omaha; O. B. Nugent, M.D., Chicago.

Prolonged Infra-red Radiation in Acute Upper Respiratory Infections.

A. R. HOLLENDER, M.D.,
Attending Otolaryngologist, American Hospital.
Chicago.

Discussion: D. R. Owen, M.D., Omaha; J. H. Hester, M.D., Louisville, Ky.

Uses of Ultraviolet in the Nose, Pharynx and Larynx.

F. L. WAHRER, M.D.,
Staff, Deaconess Hospital Marshalltown, Iowa, Otolaryngologist, Iowa Training School for Boys. Eldorado, Iowa.
Marshalltown, Iowa.

Discussion: E. G. Linn, M.D., Des Moines, Ia.; A. R. Knode, M.D., Omaha; Maurice Weisblum, M.D., Philadelphia.

JOINT MEETING OF ALL SECTIONS

THURSDAY MORNING
OCTOBER 8, 1931
9:00 O'CLOCK

BALL ROOM — HOTEL FONTENELLE
Dr. F. H. Ewerhardt, Section Chairman

Title to be Announced.

ARTHUR STEINDLER, M.D.,
Professor of Orthopedic Surgery, The State University of Iowa, Medical Department.
Iowa City, Iowa.

Discussion: Philip Lewin, M.D., Chicago; James W. Martin, M.D., Omaha.

Pelvic Irradiation in the Treatment of Carcinoma of the Uterus.

PALMER FINDLEY, M.D.,
Past President of the Association of Obstetrics and Gynecology.
Omaha.

Discussion: Clara Seipel Webster, M.D., Tuscon, Ariz.; Harold Swanberg, M.D., Quincy, Ill.; George Gellhorn, M.D., St. Louis, Mo.

Fractures Followed by Paralysis — Operative Release and Improvement (Motion Pictures).

J. R. NILSON, M.D.,
Associate Professor of Surgery, University of Nebraska, College of Medicine; Chief Surgeon, Union Pacific Railroad System.
Omaha.

Discussion: D. H. Levinthal, M.D., Chicago; M. H. Todd, M.D., Norfolk, Va.

Experience of General Surgeon with the Radio Knife.

J. E. SUMMERS, M.D.,
Chairman, Department of Surgery, University of Nebraska, College of Medicine.
Omaha.

Discussion: S. H. Groff, M.D., Long Beach, Cal.; Cleveland H. Shutt, M.D., St. Louis, Mo.

Comparative Value of Therapeutic Methods in Osteomyelitis.

MAX THOREK, M.D.,
Surgeon-in-Chief, American Hospital.
Chicago.

Discussion: John Duncan, M.D., Omaha; Disraeli Kobak, M.D., Chicago; F. W. Carruthers, M.D., Little Rock, Ark.

Hydrotherapy in Syphilis.

LOYD THOMPSON, M.D.,
Visiting Physician, St. Joseph's Hospital, Hot Springs National Park, Arkansas; Colonel Medical Reserve Corps, U. S. Army.
Hot Springs, Ark.

Discussion: Paul Roth, M.D., Battle Creek; P. S. Pouppirt, M.D., San Francisco.

THURSDAY AFTERNOON

2 O'CLOCK

JOINT MEETINGS OF ALL SECTIONS

(Continuation of Morning Program)

Dr. A. F. Tyler, Section Chairman

The Relation of Sunlight to Disease.

VICTOR E. LEVINE, M.D., Ph.D.,
Professor of Biochemistry and Nutrition, The Creighton University School of Medicine.
Omaha.

Discussion: Willis S. Peck, M.D., Ann Arbor, Mich.; Benjamin Goldberg, M.D., Chicago.

Environment, Habits and Health.

A. BACHEM, Ph.D.,
Professor of Biophysics, University of Illinois, College of Medicine.
Chicago.

Discussion: Alexius M. Forster, M.D., Colorado Springs, Colo.; G. D. Kettlekamp, M.D., St. Louis, Mo.; Benj. Goldberg, M.D., Chicago.

Selection of Physical Methods in Office Practice.

J. U. GIESY, M.D.,
Salt Lake City, Utah.

Discussion: Wm. A. Worster, M.D., San Gabriel, Cal.; L. A. Tarbell, M.D., New Haven, Conn.; George A. Zieg, M.D., Pittsburgh, Pa.

Influence of Diathermy on the Colloidal State of the Blood.

DISRAELI KOBAK, M.D.,
Assistant Professor of Medicine, Rush Medical College, University of Chicago.
Chicago.

Discussion: James F. McDonald, M.D., Omaha; A. E. Guenther, Ph.D., Omaha.

The Scope of Electro-Surgery in General Surgery.

WILLIAM E. GROUND, M.D., F.A.C.S.,
Superior, Wis.

Discussion: F. B. Freeland, M.D., Portland, Oregon; A. L. Yocum, M.D., Chariton, Ia.

Diathermy as an Aid in the Treatment of Gonorrheal Endocervicitis.

A. G. FLEISCHMAN, M.D.,
Staff Lutheran, Mercy and Broadlawn General Hospitals.
Des Moines, Iowa.

Discussion: M. A. Roblee, M.D., St. Louis; Gustav Kolischer, M. D., Chicago.

SECTION I — MEDICAL CLINICS
PARLOR A

	Monday, October 5 Section Chairman Dr. F. H. Ewerhardt	Tuesday, October 6 Section Chairman Dr. D. Kobak	Wednesday, October 7 Section Chairman Dr. N. E. Titus
8:30 to 9:15 A.M.	REGISTRATION	Light Therapy. Demonstration of Methods. N. E. TITUS, M.D., Associate in Surgery, Columbia University College of Physicians and Surgeons. New York.	Pediatrics. HERMAN JAHR, M.D., Instructor in Pediatrics, University of Nebraska, College of Medicine. Omaha.
9:15 to 10:00 A.M.	Lantern Slide Demonstration: Hodgkin's Disease Treated by X-ray. H. B. HUNT, M.D., Chairman, Dept. of Roentgenology, University of Nebraska, College of Medicine. Omaha.	Low Voltage Currents. Clinical Demonstration of Their Uses. F. H. MORSE, M.D., Author: "Galvanism and Sine Current Technique." Boston, Mass.	Pediatrics. CLYDE MOORE, M.D., Assistant Professor of Pediatrics, University of Nebraska, College of Medicine. Omaha.
10:00 to 10:45 A.M.	Pneumonia. Demonstration of Physical Methods of Treatment. J. SEVERY HIBBEN, M.D., Secretary, Pacific Coast Physical Therapy Assn. Pasadena, Cal.	Pediatrics. HARRY MURPHY, M.D., Associate Professor Pediatrics, Creighton University School of Medicine. Omaha.	Pediatrics. FLOYD CLARKE, M.D., Professor of Pediatrics, Creighton University, School of Medicine. Omaha.
10:45 to 11:30 A.M.	Arthritis. Demonstration of Physical Methods of Treatment. D. KOBAK, M.D., Assistant Professor of Medicine, Rush Medical College, University of Chicago. Chicago.	Demonstration of Fundamental Principles of Physical Therapy on Human Manikins. H. B. HUNT, M.D., Chairman, Dept. of Roentgenology, University of Nebraska, College of Medicine. Omaha.	Biophysical and Practical Aspects of Radiation. A. BACHEM, Ph.D., Professor of Biophysics, University of Illinois, College of Medicine. Chicago.
11:30 to 12:15 P.M.	Anatomico-Pathological Demonstration of Certain of the Abdominal Viscera. R. R. BEST, M.D., Assoc. Prof. of Anatomy, University of Nebraska, College of Medicine. Omaha.	Clinical Demonstration: Case of Hirschsprung's Disease Treated by Sine Current with Recovery. F. J. MURRAY, M.D., Instructor of Medicine, University of Nebraska, College of Medicine. Omaha.	Pneumonia. Technic of Treatment. L. A. TARBELL, M.D., New Haven, Conn.

SECTION II — SURGICAL CLINICS
PARLOR B

	Monday, October 5 Section Chairman Dr. J. U. Giesy	Tuesday, October 6 Section Chairman Dr. J. S. Hibben	Wednesday, October 7 Section Chairman Dr. G. Kolischer
8:30 to 9:15 A.M.	REGISTRATION	Demonstration of Fractures of the Wrist in which Physical Therapy is an Aid. JOHN DUNCAN, M.D., Clinical Prof. of Surgery, Creighton University, School of Medicine. Omaha.	Urology. Clinical Demonstration of Therapeutic Methods. J. H. FRISCHER, M.D., Kansas City, Mo.
9:15 to 10:00 A.M.	Demonstration of Fractures of Shoulder Joint in which Physical Therapy is an Aid. W. L. SUCHA, M.D., Assoc. Prof. of Surgery, Creighton Univ., School of Medicine. Omaha.	Demonstration of Fractures of Ankle Joint in which Physical Therapy is an Aid. R. D. SCHROCK, M.D., Assoc. Prof. of Orthopedics, Univ. of Nebraska, College of Medicine. Omaha.	Use of Lipiodol in Gynecology. Lantern Slide Demonstration. EARL SAGE, M.D., Assoc. Prof. of Obstetrics, Univ. of Nebraska, College of Medicine. Omaha.
10:00 to 10:45 A.M.	Demonstration of Fractures of the Femur in which Physical Therapy is an Aid. H. F. JOHNSON, M.D., Instructor in Orthopedic Surgery, Univ. of Nebraska, College of Medicine. Omaha.	Hemorrhoids. Clinical Demonstration of Electrosurgical Procedures. FRANK H. WALKE, M.D., Shreveport, La.	Demonstration of Fractures and Injuries of the Knee Joint in which Physical Therapy is an Aid. J. E. M. THOMSON, M.D., Chief, Dept. of Orthopedic Surgery, Bryan Memorial Hospital, Lincoln. Lincoln, Neb.
10:45 to 11:30 A.M.	Demonstration of Fractures of the Elbow Joint in which Physical Therapy is an Aid. JAMES MARTIN, M.D., Asst. Prof. Orthopedic Surgery, Univ. of Nebraska, College of Medicine. Omaha.	Use of the Cutting and Coagulating Currents: Clinical Demonstration. GUSTAV KOLISCHER, M.D., Senior Surgeon in Urology, Michael Reese and Mt. Sinai Hospitals. Chicago.	Clinical Demonstration: Retroperitoneal Sarcoma Treated by X-ray, Well Six Years Later. MAURICE GRIER, M.D., Assoc. Prof. of Gynecology, Creighton Univ., School of Med. Omaha.
11:30 to 12:15 A.M.	Infantile Paralysis: Clinical Demonstration of Treatment Methods. F. H. EWERHARDT, M.D., St. Louis.	Low Voltage Currents, Clinical Demonstration of Their Uses. J. U. GIESY, M.D., Salt Lake City.	

SECTION III — CLINICS ON EYE, EAR, NOSE, THROAT AND ORAL SURGERY
PARLOR C

	Monday, October 5 Section Chairman Dr. F. L. Wahrer	Tuesday, October 6 Section Chariman Dr. F. B. Balmer	Wednesday, October 7 Section Chairman Dr. E. G. Linn
9:00 to 10:00	CLINIC Electrosurgery of Tonsils. F. B. BALMER, M.D., Department of Otolaryngology, Northwestern University Medical School. Chicago.	CLINIC Electrosurgery of Tonsils. GREGG A. DILLINGER, M.D., Pittsburgh, Penna.	CLINIC Electrosurgery of Tonsils. LEWIS J. SILVERS, M.D., Associate Otolaryngologist, Ocean Hill Memorial Hospital. New York.
10:00 to 11:00	CLINIC Corneal Ulcers: Pathology and Treatment. O. B. NUGENT, M.D., Professor of Ophthalmology, Chicago Eye, Ear, Nose and Throat College. Chicago.	CLINIC Management of Middle Ear Deafness. F. L. WAHRER, M.D., Staff, Deaconess Hospital, Marshalltown, Ia.; Otolaryngologist, Iowa Training School for Boys, Eldora, Ia. Marshalltown, Iowa.	CLINIC Low Voltage Currents and Their Application in Oto-Rhino-Laryngology. F. H. MORSE, M.D., Author, Galvanism and Sine Current Technique. Boston, Mass.
11:00 to 12:00	CLINIC Medical Diathermy and Other Physical Agents in Oto-Rhino-Laryngology. ELLIS G. LINN, M.D., F.A.C.S., Otolaryngologist to the Methodist Hospital. Des Moines, Iowa.	CLINIC Diagnosis of Nasal Accessory Disease. FERRIS SMITH, M.D., Head and Neck Surgeon, Blodgett Memorial Hospital. Grand Rapids, Mich.	CLINIC Physical Methods in Rhinologic Diseases. A. R. HOLLENDER, M.D., Co-author, Physical Therapy in Diseases of the Eye, Ear, Nose and Throat. Chicago.

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E D I T O R I A L S

SUNLIGHT AND ANEMIA

Anemia is one of the most common minor ills of our generation. It is a condition which imposes a physiological burden upon the organism. It leads to general debility. It increases the tendency to intercurrent infection.

Individuals maintain health and recover from infection only when antibody formation is adequate. Diminished nutrition handicaps cells in their production of antibodies, thereby making the individual more susceptible to disease and less able to recover from disease. The sedimentation rate of erythrocytes is hastened in anemic patients. The rate of sedimentation is a very good index of the patient's ability to carry added physiologic burdens.

Anemia leaves its dire effect on the circulatory system. Paul D. White states that anemia, whether secondary or primary, is, if severe, quite a burden for the heart, since the myocardium is directly affected. Dilatation may result, murmurs appear, and angina pectoris be precipitated. According to Liljestrand and Stenström and also according to Harrison and Blalock, anemia increases the cardiac output. An examination of the circulatory system of patients with anemia often reveals certain conditions indicative of increased work on the part of the heart. These are moderate tachycardia, increased intensity of the first sound at the cardiac apex and of the aortic and pulmonic sounds, apical and pulmonic systolic murmurs, increased peripheral pulsation, and a full bounding and at times collapsible pause. These facts indicate that the heart is attempting to carry on its work under difficulties. The compensatory increase in cardiac output, if kept up for a number of years, is apt to cause an over-worked heart finally to succumb. Relatively mild and common degrees of anemia should therefore be regarded as a contributory factor in the production of circulatory and cardiac failure.

Anemia is a handicap during anesthesia and during surgical intervention. Patients with a deficiency in blood platelets are lia-

ble to secondary hemorrhage following operation. Surgical shock occurs more frequently in anemia. Acidosis and infection are more prone to develop post-operatively in the anemic. Many anemic patients have reserve energy sufficient for recovery, but no patient with a blood deficiency ever makes as rapid a recovery as a patient with normal blood. Severely anemic patients may even die as a result of the inability to bear the strain of anesthesia and operation.

Anesthesia lowers markedly the oxygen-carrying power of the blood. The oxygen-carrying power of the blood is a measure of intact hemoglobin. The blood of healthy individuals subjected for one-half hour to anesthesia under ether, nitrous oxide or ethylene shows a drop of from 10 to 25 per cent in oxygen-carrying power. The loss in oxygen-carrying power is due to the fact that hemoglobin is so altered that it cannot combine with oxygen. The icterus index, an index of red cell destruction, is increased following anesthesia. Healthy individuals, twenty-four hours after anesthesia lasting one-half hour under ether, nitrous oxide or ethylene, have an icterus index from three to four times the normal.

Patients whose oxygen-carrying power is already low have their intact hemoglobin still further reduced by the anesthetic and the loss of blood incidental to the operation. Healthy individuals require more than five days to restore their hemoglobin to normal following anesthesia. Patients that are anemic require much more time. The heart of the anemic patient, perhaps handicapped by various degrees of myocardial degeneration, has the additional burden of anesthesia and operation to carry.

Practically all pathological conditions are more or less complicated by anemia. The most important etiological factors are loss of blood through acute or chronic hemorrhage, infection, malnutrition, drugs and chemical poisons, diseases of metabolism, diseases involving the erythrocyte or leucocyte-forming organs, malignant growths, and cardiac disturbances. The existence of anemia in most cases of pregnancy should be regarded not in the light of a normal event but in the light of a pathologic phenomenon. In treating any disease it is of paramount importance to remove a co-existing anemia, a barrier to prompt and complete recovery.

Physicians have never given much attention to the problem of anemia, unless it is present in a patient in very severe form. A deviation from the normal hemoglobin value and from the normal red cell count, however slight, calls for corrective measures. An apparently healthy person with a blood picture that shows a percentage of hemoglobin and an erythrocyte count below the normal values is existing under a biologic handicap. The greatest number of the major diseases with which man is afflicted usually creep in through the accumulated effect of successively slight irritations or through the long continued operation of apparently insignificant factors. Health is more frequently undermined by the gradual operation of constant, though disregarded causes than by any great and marked exposures of an accidental kind.

For very many years little progress could be noted in the treatment or in the prevention of anemia. Many drugs were tried and many forms of iron compounds were prescribed. For some time the vogue was empirically put into practice of administering cacodylates, compounds containing arsenic. They are now known to have very little effect on the blood cells or on hemoglobin or red cell production.

It is only in recent years that we have attacked the problem of anemia in a scientific way and have brought to light fundamental facts with regard to the production of hemoglobin and the formation of erythrocytes. Knowing these important facts we can readily and with great certainty prevent certain forms of anemia or effect a cure.

The production of hemoglobin and the formation of erythrocytes are, indeed, complicated processes. In blood regeneration we have come to recognize the need for building material and for substances catalyzing the building processes. Certain materials we may regard as bricks and other materials as brick layers.

One of the important materials in the building of hemoglobin and red cells is protein. Hemoglobin we must remember is a metallo-organic protein. The supplying to the system of iron alone cannot suffice to build hemoglobin. It is not only imperative

to supply protein but also the proper type of protein. Hemoglobin contains four pyrrol groups in each molecule. This hetrocylic ring is found in such compounds as tryptophane, proline and hydroxyproline.

The rôle of the pyrrol ring has been emphasized by Abderhalden, by Bürgi and von Traczewski, by Kotake and Hirasawa, by Fontès and Thivolle, by Whipple and by Hart, Steenbock, Elvehjem and Waddell. Hirasawa and also Hirasawa and Matsuoka have observed that tryptophane stimulated hemoglobin production in various forms of experimental anemia in the rabbit. Drabkin and Miller have very recently demonstrated that tryptophane and pyrrolidon carboxylic acid and a proline mixture proved effective for hemoglobin production in rats rendered anemic by a diet consisting solely of milk. Since hemoglobin is a protein containing many other amino acids besides pyrrol-bearing ones, we are not surprised to find that Drabkin and Miller have observed that arginine and glutamic acid are also effective in hemoglobin regeneration. Fontès and Thivolle reported the favorable influence of histidine.

Hemoglobin is a chromoprotein. It derives its pigment from the presence of iron. This iron must be supplied in proper amounts and serves two purposes. It goes into the building of the hemoglobin molecule. It also serves as a biologic stimulant to the hematopoietic system as well as to other organs and even to individual cells, for it occurs in the nucleus of all cells. An excess of iron in the system may be eliminated or stored in the various organs of the body for future use. In hemoglobin building, iron may be supplied in any form. There is no difference in the matter of assimilation between organic iron and inorganic iron.

The administration of iron in the past years to patients suffering from marked anemia was not always followed by the expected success. First of all, protein was not considered in the therapeutic armamentarium, and secondly, we had no knowledge of the catalysts required in the process of blood building. It has now been established with a degree of certainty that we need an organic catalyst and an inorganic catalyst in hemoglobinogenesis. The inorganic catalyst is believed to be copper. Ever since Hart, Steenbock, Waddell and Elvehjem's announcement that copper is needed to cure anemia in rats kept on a milk diet to which even iron had been added, many papers have appeared on the subject relative to the need of an inorganic catalyst in hematopoiesis.

The organic catalyst concerned in the process is found in great abundance in the visceral organs, especially in liver, kidney and stomach. The brilliant work of Whipple and Robscheit-Robbins has done very much to elucidate the very perplexing problem of hematopoiesis. The catalyst can be isolated in the form of a concentrated liver extract. It is interesting to note that the potent principle according to Dakin, West, and Howe is an amino acid complex, from which they have separated by means of hydrolysis. β-hydroxyglutamic acid, and hydroxyproline. The organic catalyst, according to Whipple, has the specific rôle of aiding in the building of the erythrocytic stroma.

In recent years scientific research has added another factor in the mechanism of hematopoiesis. This factor is sunlight, which through its ultraviolet component plays an important rôle in the prevention and treatment of anemia.

Levine in his article in this number emphasizes some very interesting points of similarity between anemia and rickets, a disease cured and prevented by sunlight or ultraviolet in the presence of a liberal intake of food calcium and food phosphorus. In rickets we have a lowered gastro-intestinal acidity. So do we have in anemia. A lowered gastro-intestinal acidity interferes with the absorption of calcium available to the organism. A lowered gastro-intestinal acidity also inteferes, according to Mettier and Minot, with the absorption of iron, and results in a decrease in iron available for blood regeneration. Both in rickets and in anemia we may encounter characteristic changes in the histology of the bone-marrow and in the type of cells sent by the blood-forming organs into the circulatory stream. Anemia is by no means an infrequent complication of rickets. Rickets can be cured by sunlight or ultraviolet provided the diet carries a sufficient intake of calcium and phosphorus. Anemia

can be cured by sunlight or ultraviolet provided the diet carries a sufficient intake of the substances required in the building of hemoglobin and red cells.

What is the rôle of sunlight or ultraviolet in the mechanism of hematopoiesis? Laurens and Mayerson have very recently answered this question. Sunlight or ultraviolet is powerless to produce hemoglobin but is very effective in the building of the red cell itself. It seems to have the same function as the anemia-preventing or anemia-curing factor in liver or liver extract. It aids in the building of the erythrocytic stroma. Sunlight or ultraviolet induces an increase in erythrocytes or in such intermediary forms as reticulocytes without inducing a marked change in the hemoglobin content. In view of the fact that in pernicious anemia we witness a remarkable shortage of red cells, we may state with much emphasis that ultraviolet or sunlight is especially indicated in the treatment of this disease.

That sunlight or ultraviolet is definitely and vitally concerned in the problem of erythrogenesis is to be gleaned from the fact pointed out by Levine that the erythrocyte and the reticulocyte counts show a seasonal variation. It is lowest in an individual during the winter and highest in the summer. In the light of this fact it is interesting to note Mills' recent study of pernicious anemia with references to its geographic and climatic distribution. He finds that the death rate from pernicious anemia is highest in the temperate zone, but lowest in the tropics. In our own country the death rate from pernicious anemia is lowest in the southern states, except Florida with a large influx of sick people from other parts of the country. The high death rate for pernicious anemia in Colorado and California may also be accounted for by the same fact. Pernicious anemia is a disease in which the organism is unable to maintain the process of erythrogenesis. Since sunlight is concerned in the building of red cells, it is very obvious that in tropical countries pernicious anemia would be less apt to occur, and if it did occur it would be less fatal.

The importance of ultraviolet in the treatment of anemia has been brought out very emphatically in the investigations of Macht. This brilliant worker has discovered the exceedingly interesting fact that the blood serum or the spinal fluid of an individual suffering from pernicious anemia is very toxic to plant protoplasm. This phytotoxic property is not shown by specimens of blood or spinal fluid coming from patients with secondary anemia. The serum of a patient suffering from pernicious anemia becomes less toxic when it is irradiated with ultraviolet. The toxicity can be still further diminished by addition of certain photodynamic sensitizers.

In the practice of curative medicine as well as in the practice of preventive medicine, we are often apt in our enthusiasm to emphasize a single tree or to overlook the forest entirely. Cod liver oil or ultraviolet alone cannot cure rickets. We must also supply the material required in the process of ossification. Liver extract alone is inefficient in anemia unless iron be supplied at the same time. Ultraviolet alone or sunlight alone is not a cure for anemia. Looking at the pathological picture in its entirety and taking into consideration the newly discovered laws governing hematopoiesis, we may now lay down the following postulates for the treatment of anemia, mild, moderate or severe, primary or secondary in origin:

I. The elimination, if possible, and the treatment of an underlying cause, such as infection or metabolic disease.

II. The securing of sufficient physical and mental rest, and the complete elimination or the reduction to a minimum of hurry and worry.

III. The ingestion of an adequate and well-balanced diet.

IV. The inclusion in the adequate and well-balanced diet of those foods abundant in iron and in the anemia preventing factor found in maximal amounts in liver, kidney, chicken gizzard, apricots, peaches and prunes.

V. Provision for sufficient and proper exposure to sunlight or to ultraviolet rays.

These five postulates hold the ideal treatment for anemia. When any one of the five measures is omitted in treatment, failure to obtain the most favorable therapeutic responses should be expected.

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NIKOLA TESLA

On July 10, the scientific world offered unstinted birthday felicitations to Nikola Tesla in recognition for his monumental contributions in the field of electrical research. On that day Tesla quietly celebrated his seventy-fifth birthday. His accomplishments in the field of electrical science have been so rare, unusual and extraordinary in nature that the appelation of "wizard" seems but a natural tribute to his name. As an electrical engineer his greatest discoveries and inventions were naturally linked with utilitarian pursuits of a commercial nature. Not infrequently the by-products of such researches may assume significant importance in other channels than those originally intended. To this very exception the medical world has reasons to be grateful to Tesla's brilliant labors in the field of high frequency and high potential currents.

Roentgenology and physical therapy have both been materially advanced by the adoption of certain devices that emanated from the mind of this clear seeing and brilliant scientist. The Tesla coil became universally known when Roentgen's discovery was first verified throughout the civilized world. The alternating currents resulting from the action of this device are of exceedingly high frequency (10 to 20 millions per second) as compared with the Rhumkooff coil with mechanical contact breakers. So great is the effective electromotive force evoked by this type of coil that unusual measures must be taken, such as immersing the whole coil in an oil bath to establish complete insulation. Another contribution of potential importance is electrical oscillation.

The Tesla oscillator has for some unknown reason not been as frequently employed as it deserves. It is an inexpensive, durable and compact instrument, and affords almost indefinite immunity against any disturbance of its insulation. It is claimed that electric currents can be intensified by this means to enable a copper wire to carry 50,000 horsepower across the ocean.

In February 21, 1891, Tesla first published his researches regarding his observations of employing alternators with a multiplicity of terminals.[1] By the introduction of transformers he was able to increase the potential to an almost incredible number of volts, and

proved thereby that high frequency and high potential currents could be made to pass through the human body without any other complication than raising the temperature of the part. A spectacular portion of this thesis consisted in the demonstration that sufficient energy could be built up to light several incandescent lamps without the slightest danger to the person through whom the currents were passing. This is described by the author as follows: "The writer's experience tends to show that the higher the frequency the greater the amount of electrical energy which may be passed through the body without serious discomfort; . . . . . By taking the globe of a lamp in the hand, and by bringing the metallic terminals near to or in contact with a conductor connected to the coil (that is to say connected to one terminal of the secondary of an induction coil whose primary is energized by an alternating current of very high frequency), the carbon is brought to a bright incandescence and the glass is rapidly heated. With a 100-volt 10 c.p. lamp, one may without great discomfort stand as much current as will bring the lamp to a considerable brilliancy; but it can be held in the hand only for a few minutes, as the glass is heated in an incredibly short time."

The foregoing extract is purposely included in order to render belated credit to Tesla for his priority report on the physiologic possibilities of high frequency currents. His published work on the subject of high frequency phenomena[2] is a remarkable index of the scientific method utilized in these researches. His demonstrations of its physical action is as conclusive and as authoritative as any of the later writings by men who had the added advantage of referring to published bibliographies for scientific inspiration. While it may not be certain that Tesla was particularly sensitive to the tremendous physiological possibilities stored within this type of circuit, his numerous publications are, nevertheless, rich in many statements indicating his prophetic vision with which he viewed the economic and commercial possibilities of energy transmission through the channels of high frequency and radio energy.

Probably without exception Tesla's basic accomplishments have been in the above mentioned fields of electromagnetic phenomena, particularly those that have to do with radio frequencies. A decade ago it might have been a wild speculation to link up radio frequency with medical practice. Today it is an accomplished fact. Indeed all indications point to a new evolution of high frequency therapy, namely in the direction of radio therapy. Biophysical research in this field has elicited proof that therapeutic fevers can be induced without hazard to the patient; that it can influence the blood-chemistry of the individual; that temperatures can be raised locally without electrodes or other types of coupling. In other words wireless transmission of energy is an accomplished fact in the field of medical therapeutics as it is in the world of commerce.

Through the inspiring researches of this man, initiated over four decades ago, modern therapeutics is beginning to tap into a branch of electrical phenomena which may seem radical and revolutionary to us but which holds tremendous benefits for mankind. Experience has often taught us that the obvious things in life often escape our notice for want of its close proximity. It has taken forty years of brilliant labor to shake the even tenor of medical thought into conviction or rather suspicion that a new channel of therapeutics is about to open up by way of radio transmission. It is our conviction that the next phase of medical high frequency therapy lies in that direction.

Physical therapy has at all times been cognizant of Tesla's brilliant contributions to science, particularly that branch related to its own practice. In appreciation for all that has been indicated above we add our congratulations and sincerest best wishes to Tesla on his seventy-fifth birthday. We pray that the allotted years remaining to him will be happily mellowed in good health and in the completion of his plans for interplanetary power transmission.

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(2) Inventions, Researches and Writings of Nikola Tesla (With Special References to his work in Polyphase Currents and High Potential Lighting) by Thomas Commerford Martin. New York: *The Electrical Engineer,* 1894.

Correspondence

The Editor,
ARCHIVES OF PHYSICAL THERAPY,
Chicago.

Dear Sir:

Having had considerable trouble with the so-called edge effects in using block tin electrodes, especially in rectal and gynaecological cases, where the skin under the lower edge of the inactive electrode on the abdomen, becomes much warmer than any other part, the idea occurred to me to adapt the principle used in the larger body electrodes. For the past year I have been using perforated metal electrodes, and find that it has superior advantages.

There is practically no edge effect, probably due to the breaking up of the complete surface of the electrode, and more than doubling the length of the edge line.

The electrode will stand a much greater strength of current, than usual, probably half as much more than the solid one without any discomfort to the patient, and especially when using two electrodes, cut this way in any condition calling for their use.

The electrodes adapt themselves to any inequalities of the surface much better than the solid ones.

I usually attach a five foot insulated wire to each electrode with solder. The wire is spread near the edge and anyone expert with a soldering iron can make a permanent attachment to one surface without making a hole on the under side. This could be varied by attaching a short wire with a tip to receive the end of the ordinary connection; but the complete wire on each electrode gives a much more satisfactory connection than any clips I have been able to find.

A sharp knife working over a hardwood board will cut out these strips in the body of the electrode, leaving a very smooth internal edge.

With the ordinary milliamperage used, no insulation is necessary under the cord attachment; but in using heavier doses—100 m. a. per square inch, place a small square of rubber, usually cut from an old pair of surgical gloves, under the spot where the wire is soldered and under the first inch of the wire itself, where the insulation receives the hardest wear.

There are probably further variations that can be suggested; but I have found this so very satisfactory, and have not seen any accounts of the principle being adapted to small electrodes before, that I pass it on in the hope that it may be found to be of some advantage in every day work.

S. C. W. MORRIS.

June 29th, 1931.
214 Sixth Avenue, West,
Calgary, Alberta.

Ultraviolet Much the Same in Antarctica as Here

Ultraviolet light observed on the Antarctic continent by scientists of the Byrd expedition is very similar in nature to that observed in Washington. The photographs on which this conclusion is based were made at the bottom of the world by Malcolm P. Hanson, and the findings announced jointly by himself and Dr. E. O. Hulburt of the U. S. Naval Research Laboratory.

The rainbows formed by the light of both the sun and also of the moon during the long night of the Antarctic, were measured and found to contain practically the same range of colors. These spectra are of importance to science as indicating that the quantity of ozone in the upper atmosphere does not change with the seasons and is much the same in different parts of the world. The comparison spectra were made with similar equipment by the Naval Research Laboratory in Washington.

The short wave limit in the ultraviolet was found to be much the same in November and January in Little America as it was in December or January in Washington.

The penetration of the shortest light waves is prevented by the presence of small amounts of ozone, a form of oxygen, in the upper atmosphere. The amount of this gas is astonishingly small in view of its importance for protecting mankind from too severe sunburn. The thickness of the ozone layer that keeps back the shorter waves from penetrating the atmosphere would be only about one-eighth of an inch if brought down to the surface of the earth.

The moon spectra were taken in April and July by the expedition, both observations being made during the Antarctic winter night.—*Science News Letter,* July 4, 1931.

CURRENT NEWS AND COMMENT

Professor Victor E. Levine Honored

Dr. Victor E. Levine, professor of biochemistry and nutrition at Creighton University, was elected president of the Nebraska Academy of Sciences at the closing session of the thirty-second annual meeting held May 8 to 10 at the University of Nebraska at Lincoln. This is the highest honor Nebraska Scientists can bestow upon one of their colleagues.

The Nebraska Academy of Sciences is affiliated with the American Association for the Advancement of Science. The local division of the national association has over four hundred members, from every branch of science.

Temple to Inaugurate X-Ray Department

An x-ray department of twenty - eight rooms will be opened shortly at Temple University School of Medicine and Temple University Hospital, under the direction of Dr. William Edward Chamberlain, formerly professor of medicine, Stanford University School of Medicine, San Francisco. Twenty-two rooms are in the hospital and six in the school of medicine. Special rooms are provided for various types of roentgenograms, including one for surgical radiography, with shock-proof apparatus that permits anesthetics to be used in the same room with the x-ray machine. A feature of the dark room for developing films is a mechanical conveyor that removes films into a lighted drying room within fifteen minutes after exposure. The therapy rooms have a protective flooring of lead rubber tile to prevent penetration of the rays. In addition there is a machine shop for research on x-ray machinery.—Ab. *J. A. M. A.*, 96:1417.

Growing Disease Germs Generate Electricity

Growing masses of deadly disease germs generate electricity just as real and effective as the output of the familiar dry cell that rings your door bell, Dr. Barnett Cohen of Johns Hopkins Medical School reported to the Society of American Bacteriologists.

Out of bacteria, some of the sort that cause diphtheria, dysentery and other ills, he has constructed what he calls a "bacterial battery" which furnished current of about two milliamperes at a pressure of 35 volts. This was built up of unit cells composed of a few teaspoonfuls of growing germ culture coupled to a sterile solution and from each small cell there discharged through 300 ohms resistance about a hundredth of a milliampere of electricity each minute.

Dr. Cohen did not suggest practical utilization of the relatively large amounts of electricity produced by the growing germs, but he explained that his studies are important because they throw light on the way bacteria grow.

"It is well known that bacterial growth is accompanied by a chemical reduction of the culture medium together with a loss of heat and the liberation of oxidation products, such as water and carbon dioxide," Dr. Cohen said, explaining that the bacteria growth can be measured by electricity produced. — *Science News Letter,* January 3, 1931.

The Health Resorts of Odessa

Odessa, and particularly its mud health resorts, the Koujalnik and Hadjibei "limans," occupy a prominent place among the health resorts of the Ukraine. They are situated on the shores of firth—arms of the sea separated from it by a flat elevation of the ground. As a result of evaporation due to the constant influence of the air and the sun, the water in these firths—the "rapa"—is saturated with a concentrated solution of salts, having from 4.5 to 27 Baumé degrees, and contains about 76.5 Gm. of salt in 1 liter of water.

The bottom of the firth is covered with a thick layer of mud or slime, formed as a result of the dying out of the Black Sea's ancient fauna, as well as of the rising of the sea level and of its water becoming more salty with the access of waters from the Mediterranean Sea during the glacial era. This slime consists chiefly of numerous products of the putrefaction of organic matter and bacterial bodies. The process of formation has con-

tinued until even our time, as is proved by the presence of plenty of hydrogen sulphide on the bottom of the firth. From its slimy origin the mud of the firths, liman mud, unlike the turfy mud in western Europe, is extremely plastic, oily, thick and quick to oxidate.

A long time before Odessa was founded the local population used this mud for the healing of all kinds of chronic diseases. The treatment of patients with liman mud was recognized by the medical authorities in the fifties of the last century, from which time dates the construction of the first special clinics and hospitals in Odessa. The mud and rapa are used for general and local baths, applications and gynecologic tampons. The following diseases are said to be affected by means of the liman mud: chronic and subacute arthritis, chronic gynecologic diseases and chronic and subacute inflammatory processes of the peripheral nervous system. The results of the treatment with liman mud are seen from the following items: Out of 1,000 arthritic patients 90 per cent were much improved; 40 per cent of them were able to move their joints, and 40 per cent of the patients suffering with all kinds of diseases of the peripheral nervous system got much better.

This is a matter of great importance because the number of arthritic patients is constantly increasing. According to the *Deutsche Krankenkassen Statistik* (Zimmer), the number of those patients is 8.2 times greater than that of tuberculous patients. Tht number of patients receiving their course of treatment on the Hadjibei and Koujalnik limans is increasing every year. In the summer of 1923 there were 1,500 patients and in 1930 there were 9,000.—*Jour. A. M. A.*, 96:964 (March 21), 1931.

Physical Therapy in Government Hospitals

The physiotherapy clinic at Walter Reed General Hospital is one of the best equipped clinics of its kind in the United States. The hydrotherapy department is well equipped for giving the various types of baths, including a cabinet bath room with four cabinets and a whirlpool room equipped with three whirlpool baths. The electro therapy department is equipped with up-to-date high frequency and low voltage machines sufficient to treat twelve patients at one time, two rooms are equipped for ultraviolet irradiation; one room contains two air-cooled mercury vapor arc lights and the other room contains a high amperage carbon arc light. The thermotherapy department is equipped with sufficient apparatus to treat a number of patients both by means of radiant heat and light and infrared rays. The massage department is very complete and provides for both massage and treatments by mechanical vibration. In addition to the equipment installed in the clinic this department has the following portable equipment for treatment of bed cases in the wards: Three high frequency machines, one mercury vapor arc light and a large assortment of portable apparatus for giving radiant heat, light and infrared ray treatments at the bedside. There is also a well equipped gymnasium for the treatment of orthopedic and heart cases and cases requiring muscle reeducation, training in coordination and graduated exercises. As an indication of the extent to which physiotherapy is being employed in our military hospitals today there were 425,488 treatments administered to patients in our nine large hospitals during the year 1929.

The physiotherapy department at Walter Reed Hospital expects to move into a new permanent building which is centrally located in the hospital group making it easily accessible to all wards and departments. It will be complete in every detail and its doors are always open to visitors. If you should be in Washington I can assure you a cordial welcome should you visit this clinic.—*M. H. P. T. and E. S.*, 50:93 (March) 1931.

The Council on Physical Therapy has not considered or approved any electromagnetic wave generators producing wave lengths shorter than the short waves commonly used in radio. There has been some research in the field to determine the physiological effects but as yet there has been no conclusive scientific evidence accumulated. The work of the Western Pennsylvania Hospital Institute of Pathology has never been verified by the Council on Physical Therapy.

Experiments with rats and mice have shown that energy in the short wave lengths will raise the body temperature of the animals and a short exposure under proper circumstances will produce death.—*Jour. Ark. Med. Soc.*, **27**:254 (May) 1931.

What Are Cosmic Rays?

A very interesting discussion which developed into an impromptu debate between Sir James Jeans, the famous British astronomer from Cambridge, England, and Professor Millikan, physicist and president of the California Institute of Technology, was recently enjoyed by a large and enthusiastic audience of scientists at the Institute in Pasadena, California, in regard to the nature and probable origin of the cosmic rays.

These radiations range from .07 to .0035 angström units and are the shortest wave lengths that scientists have so far measured. They are apparently stopped by about eight feet of lead or a mile of the earth's crust, and are twice as numerous and as powerful on Pike's Peak elevation, about five miles, as they are at sea level. They enter the earth's atmosphere with equal intensity from all directions, apparently from the remote regions of intra-stellar space.

Professor Millikan holds the opinion that these radiations are due to the synthesis of atoms, the meeting and combining of electrons and protons. In other words, that the creation of matter is a continuous act and is still going on.

Sir James Jeans holds the opposite view, that the cosmic rediations are due to the destruction or explosion of atoms, and that matter is dissolving into radiation and disappearing from the universe of manifestation.

The debate finally simmered down to the admitted fact that Professor Millikan's experiments and observations had to do with about 95 per cent of the cosmic radiations which are of relatively longer wave lengths and that he disregarded the relatively small amount of hard rays of shorter wave lengths. Sir James, on the other hand, believing that the harder rays, although fewer in number, were more significant than the 95 per cent of relatively softer radiations. Professor Millikan remarked that one of them seemed to have hold of the head and the other the tail of the animal. Sir James then replied that it seemed to have come down to a question of quantity versus quality. Sir James' final contention was that science knows of no process by which radiations become harder, but is perfectly aware of the tendency of hard rays to become softer, and that his view was that the softer cosmic rays were simply the original hard rays that had become softened by passing through matter of varying degrees of density in space.

Both speakers were very much in earnest, spoke with the grace and charm of manner that would be expected of the master minds of our time, and were roundly applauded by the interested audience.

Report on Physical Therapy in New York City

In order to promote wider interest in the scientific uses of physical therapy, a series of seminars were held at half-past three on Wednesday afternoons for a period of four months, ending in May under the auspices of the New York Physical Therapy Society. All the lecturers at these seminars were authorities not members of the Society. The whole course was very well attended. The lectures started with two seminars devoted to the physics of radiation. The lectures and demonstrations were given by Professor Free of the New York University, in his own laboratory. The New York Physical Therapy Society meets on the evening of the first Wednesday each month and regular meetings of the Society were included in this series.

These meetings were addressed by such men as Edgar Mayer of Saranac, Howard Kelly of Johns Hopkins, Clay Ray Murray of Columbia and Ross Pemberton of Philadelphia. The other seminars were given mostly in Beth-Israel Hospital because the lecture room there is so convenient for clinical demonstration purposes. The clinic on electrosurgery was held at the Medical Center, Columbia University, by William Schmidt of Philadelphia.

All of the departments of physical therapy were thrown open to the members of the seminar and an effort was made to have the particular modalities clinically demonstrated during the week following the lecture in the series. For instance, when Harry Eaton Stewart of New Haven lectured on diathermy, all directors of the different departments in the hospitals made it a point to give special demonstrations of all diathermy techniques during the following week. The hours of these demonstrations were made for the convenience of the members of the seminar. The clinics were very well attended.

The following is a complete list of the lecturers and their subjects:

February

4th—8:30 P. M. Clinical Uses of Ultraviolet Radiation. *Dr. Edgar Mayer,* Saranac Lake, N. Y.

11th—3:30-5:00 P. M. Physics of Ultraviolet Radiation. *Dr. E. E. Free,* Special Lecturer in General Science, New York University.

18th—3:30-5:00 P. M. Physics of Photo and Heat Therapy. *Dr. E. E. Free.*

25th—3:30-5:00 P. M. Physiology of Ultraviolet Radiation. *Dr. George H. Maughan,* Dept. of Physiology, Cornell University. The Effect of Ultraviolet in Cutaneous Conditions. *Dr. George M. Lewis.*

March

4th—8:30 P. M. Massage. *Dr. Ralph Pemberton,* Physician to Presbyterian Hospital, Philadelphia, Associate Professor of Medicine in the Graduate School of the University of Pennsylvania.

11th—3:30-5:00 P. M. Physics of Medical Electricity. *H. J. Holmquest,* B.S., M.E., Formerly Secretary of Council on Physical Therapy of A. M. A., Chicago.

18th—3:30-5:00 P. M. Electro-Static Therapy. *Dr. William D. McFee,* Director, Department of Physical Therapy, Boston City Hospital, Boston.

25th—3:30-5:00 P. M. Low Voltage Currents. *Dr. Frank H. Krusen,* Director, Dept. of Physical Therapy of Samaritan Hospital and Associate Dean of Temple University, Philadelphia.

April

1st—8:30 P. M. Physical Therapy in Fractures. *Dr. Clay Ray Murray,* Assistant Professor of Surgery, College of Physicians and Surgeons, Columbia University.

8th—3:30-5:00 P. M. Physical Therapy in Orthopedics. *Dr. Walter I. Galland,* at Beth-Israel Hospital.

15th—3:30-5:00 P. M. Surgical Diathermy. *Dr. William Schmidt* at McCosh Amphitheatre, Presbyterian Hospital, Broadway and 168th Street.

22nd—3:30-5:00 P. M. Medical Diathermy. *Dr. Harry E. Stewart* at Beth-Israel Hospital.

29th—3:30 to 5:00 P. M. Physical Therapy in Urology. *Dr. F. G. Harrison* at Beth-Israel Hospital.

May

6th—8:30 P. M. Indications and Contraindications of X-Ray Radiation. *Dr. Francis Carter Wood.* Treatment of Cutaneous Cancer and Pre-cancerous Lesions. *Dr. George Miller MacKee* at New York Academy of Medicine.

13th—3:30-5:00 P. M. Hydrotherapy. *Dr. Joseph B. Nylin* at the Ruptured and Crippled Hospital, 321 East 42nd St.

20th—3:30-5:00 P. M. Physical Therapy in Gynaecology. *Dr. Thomas H. Cherry* at Beth-Israel Hospital.

27th—3:30-5:00 P. M. Posture as a Therapeutic Procedure. *Dr. Royal S. Haynes.* Posture and Exercise in Adults. *Dr. K. G. Hansson* at the Ruptured and Crippled Hospital.

Clinical Demonstrations of Cases and of Technic in the Physical Therapy Departments of the Following Hospitals

Bellevue Hospital—Dr. Charles F. McCarty and Staff. Hours to be arranged.

Beth-Israel Hospital, Stuyvesant Park East (17th Street and 2nd Avenue)—Dr. William Bierman and Staff. 2:00-3:30 P. M., Wednesday.

Hospital for Joint Diseases, 123rd Street and Madison Avenue—Dr. Jerome Weiss and Staff. 1:00-3:00 P. M., Tuesday.

Montefiore Hospital, Gun Hill Road—Dr. I. M. Leavy and Staff. Hours to be arranged.

Mount Sinai Hospital, 100th Street and 5th Avenue—Dr. Heinrich Wolf and Staff. 9:00-10:30 A. M., Wednesday.

Presbyterian Hospital, 168th Street and Broadway—Dr. Norman Titus and Staff. 11:00-12:30, Tuesday.

Reconstruction Hospital, Unit of The N. Y. Post-Graduate Medical School and Hospital, 100th Street and Central Park West — Dr. Harold Herring and Staff. 10:30-12:00, Thursday.

Ruptured and Crippled Hospital, 321 East 42nd Street—Dr. K. G. Hansson and Staff. 2:00-3:00 P. M., Saturday.

A charge of $25.00 was made for this seminar (including both the didactic lectures and clinical demonstrations).

Those who presented papers and filed them with the Secretary will have them published in the "Archives" in the coming issues.

NORMAN E. TITUS, M.D.

THE STUDENT'S LIBRARY

BOOK REVIEWS

CHRONIC ARTHITIS AND RHEUMATOID AFFECTIONS WITH RECOVERY RECORD. By *Bernard Langdon Wyatt,* M.D. Pp. 166. Price $2.50. New York: William Wood and Company.

From a literary point of view this small volume is a charming example of lucid writing intersposed with delightful platitudes. The author has however attempted the impossible task of reviewing the entire subject in the space of this short treatise. He has merely touched upon many of its problems, indicated its limitations or his dissatisfaction with certain theories without exhausting the rich material at his disposal.

The foreword by Van Breeman is a pathetic word-picture of the blundering methods heretofore used in connection with our management of this particular problem. It is, nevertheless, a repetition of what has been said before by other men in other books and at other times. Modern medicine views this subject with a more optimistic attitude, and feels that much could be accomplished if the patient would be placed in a position where his complete cooperation is assured.

Much could have been said in favor of chemotherapeutic medicinals which were completely omitted from these pages. The author has failed to touch upon this important branch of modern therapeutics, probably the most specific within our reach. His cautious and uncertain attitude toward drug therapy has left an open gap in his thesis. Indeed, the chapter devoted to this phase of the subject is frankly nihilistic in its attitude toward medicinals, and uncertain regarding the efficiency of vaccines or proteintherapy. A great portion of the book is devoted to the exposition of physical therapy in connection with chronic arthritis and fibrositis. In spite of the author's enthusiasm for this branch of therapy there is much in his exposition that raises a doubt as to his complete orientation with this form of therapy. For example, it is now generally accepted that diathermy is most useful in chronic rather than in acute arthritis; that the syphonage method of Schellberg is superior to that of the Plombierè method; that negative galvanism is of greatest value in fibrositis.

The author's opinion regarding the value of sunshine, artificial ultraviolet rays, open air therapy, exercise and orthopedic measures is in full agreement with the accepted opinions of the highest authorities on the subject. The ideal place for the arthritis no doubt is in a climate or in an environment wherein the most conservative and experienced management of the case can be obtained. The author has chosen the most ideal climate in the United States to practice the specialty. The book is a delightful example of vigorous style plus a fearless advocation of methods seldom utilized by those specializing in chronic arthritis.

HIGH FREQUENCY PRACTICE. By *Burton Baker Grover,* M.D., President, Western School of Physical Therapy; Past-President American Physical Therapy Association. Sixth edition de luxe. Pp. 624, 6x9 inches, 140 illustrations. Kansas City: The Electron Press, 1931. Price, $7.50.

This book attempts to cover among other things the subject of the physics of high frequency currents. In this it has not succeeded too well. While the information is enlightening it is meager in numerous instances and altogether too vague on important phases of the subject to be of real scientific value. It is questionable whether the average clinician is interested in the fundamentals of electricity. His interests are chiefly in the practical sides of medical electricity. A brief resumé of this part of the work, therefore, would have been sufficient and probably as much as the general physician would desire to review.

Several sections of the book have been written and revised by other workers. Thus the chapter on electrothermic methods in neoplastic and allied diseases is covered by William L. Clark of Philadelphia, the chapter on gynecology, by A David Willmoth of Louisville, Kentucky.

A chapter which is admirably covered is the one on blood pressure. The unfortunate thing is the fact that recent advances in hypertension, especially with reference to treatment, are not even mentioned. Diathermy is by no means a specific for hypertension and accurate data concerning its permanent effects are still lacking.

The chapters on eye and ear, nose and throat are not up to date. So many changes have resulted in the use of physical measures in these specialties that a complete revision of these sections is necessary to bring the work down to date. The specialist will not be influenced by the results in a few cases of an enthusiastic worker. Nor will he accept general statements based on nothing more than clinical trials uncontrolled. In a word the endeavor at the present time is to rationalize the technics and the methods and to recognize and appreciate the indications and limitations.

Regardless of what has been said concerning some of the weaker points of the book, the text in general is good. Dr. Grover is a pioneer in

physical therapeutics and deserves much credit for his efforts to foster it on a high plane. His individuality is injected into his book and while reviewers may not approve of the style, the apportionment of pages on certain subjects, and the generalized discussions, they must agree that as a whole the work represents the life's accomplishment of one individual in a special and new field of medical treatment.

PRAKTISCHE TUBERKULOSE-BUCHEREI BEINEFTE DER PRAKTISCHEN TUBERKULOSEBLATTER. Herausgegeben *von Dr. Kurt Klar-Scheidegg-Allgau* 6. Heft, Paper. Pp. 39 with 20 illustrations. Price, 2.80 R. M. Stuttgart: Ferdinand Enke Verlag. 1931.

RONTGENDIAGNOSTIK DER LUNGENTUBERKULOSE UND IHRE BEDEUTUNG IM RAHMEN DER GESAMTUNTERSUCHUNG. Von *Dr. Friedrich Koester.*

In the thirty-nine pages of this little manual the author covers with considerable detail some of the important factors in physical diagnoses as they effect the roentgen shadow densities on the film and their value as an aid in interpretation. He also discusses some of the technique essential in the taking of a good chest film; the normal lung on the film; the qualitative diagnostic factors as determined by roentgen film studies; the value of the roentgen examination in pointing out the needs for therapy and determining the prognosis. The various types of tuberculosis pleuritis are also shown, and a discussion of the differential diagnosis of the various important pathological changes found in examination of the lungs. Twenty illustrations, which effectively illustrate the points to be brought out, are an important adjunct to this small monograph. While there is nothing revolutionary or new in the contents of this small manual, it should be read by those interested in lung disease.

EVERYDAY PHYSICS. By *Carlton John Lynde,* Ph.D., Professor of Physics, Teachers College, Columbia University, New York. Pp. 577 with 401 illustrations. Leather. New York: The Macmillan Company. 1930.

The author has reduced the study of everyday problems in physics to the simplest detail. The exposition is couched in non-technical language, easily comprehended by beginners and by those who have long been removed from this special field of inquiry. The text has been profusely illustrated and therefore lends itself toward a better understanding of the material under discussion. The contents of the work is divided into six large sections and deals with "Elementary Mechanics; Heat; Electricity; Light; Sound; Mechanics."

The ever-increasing specialization of modern medicine in the direction of things physical, or rather biophysical, has emphasized our special need for a better understanding of the physical nature of the world we live in. Unfortunately, our modern program of medical education has been so thoroughly overloaded with the studies of chemistry and pharmacology, and other related subjects of medical discipline, that we have greatly neglected the physical side of phenomena as found in all things living—a neglect which is at present tacitly acknowledged by the zealous searchings into this phase of biologic science. The present volume was essentially written as an elementary exposition on certain phases of physics which falls into the interests of modern medical practice. The recognition of x-ray and other forms of radiation as well as electrical methods in modern therapy has necessitated greater familiarization with the physics related to their measures. In other words, the medical profession is becoming more physical therapy-minded. "Everyday Physics" offers a popular exposition on the very fundamentals related to electrotherapy, thermo- and photo-therapy, and the mechanics that govern their actions. The entire text is frankly elementary in style and is so intended. It has, however, the virtue of being easily understood and hence, it can be utilized as a popular review for the fundamental physics related to modern electrotherapy.

PHYSICS OF RADIOLOGY. For the Student of Roentgenology and Radium Therapy. By *J. L. Weatherwax,* M.A., Physicist, Philadelphia General Hospital, etc., with a Foreword by *Henry K. Pancoast,* M.D., Professor of Roentgenology, University of Pennsylvania. Pp. 240 with 126 illustrations and 32 tables. New York: Paul B. Hoeber, Inc. 1931.

This volume offers the modern student of Radiology the required fundamental information regarding the nature and action of the various forms of energies utilized in its practice. The foreword by Dr. Pancoast describes a dual picture of the pioneer who gathered his experiences under great difficulties but, nevertheless, very painstakingly, and often at the cost of health and life; a fact which made the pathway of the newer generation less hazardous and more efficient in their chosen work. The book, therefore, offers many advantages to the beginner in the form of a summary of all the new advances in the physics of radiology. It includes most of the salient facts related to the modern theories on radiation. Certain typographical errors have crept into the text as a result, no doubt, of over hastiness in the correction of the final proof. For example, the author inadvertantly credits the discovery of Galvani's frog experiments to the year 1876. According to the most accurate records this striking observation was first made in the year 1786, or rather it was so published in September 20, of that year. Another typographical error is observed on page 157, the third word in the fifth line: "celloidal" for colloidal. The examples could be multiplied if space permitted.

The exposition seems to attain its best momentum when it reaches the third chapter, and from there on the author appears most at home with his subject. The first two chapters, dealing with atomic theory and principles of electricity, are altogether too brief in their material and descriptive matter to satisfactorily balance with the succeeding chap-

ters. Indeed, the author has omitted as much of the newer theories regarding the present conception of the atom as he has included. The Bohr conception of the atom is today a much questioned theory and has been replaced by other theories of equal interest. Since this book makes no pretentions to be considered as exhaustive in its treatise of the subject, the various topics are discussed in a semi-popular style and is limited to the essential facts related to radiation physics. As such the book offers a practical and general digest of the current theories and modern conceptions of the mechanics and the practical application of the energies related to radiation physics. The many illustrations incorporated in the text are of material assistance in clearing up some of the technical descriptions connected with the subject. The entire exposition has been couched in simple language, a fact which lends itself for easier comprehension and hence greater appreciation.

There has long been a need for such a popular exposition. Many physicians have heretofore avoided the actual study of the subject because of their unfamiliarity with objectionable mathematics so often found associated with the subject. The author is to be congratulated for reducing his exposition to the vocabulary of simple definitions and non-mathematical descriptions and will thus be more appreciated by the average student about to enter the field of radiology. The book is recommended to all practitioners of this special branch of medicine.

A TEXT-BOOK OF PATHOLOGY. Edited by *E. T. Bell,* M.D., Professor of Pathology in the University of Minnesota. Illustrated with 316 engravings and 2 colored plates. Pp. 627. Philadelphia: Lea and Febiger. 1930. Price $8.00 net.

There is always a need for a good book on pathology, especially one like this, aiming as it does to bring the structural changes in disease into close relation with the problems of clinical teaching. "It is felt that the cooperation of several pathologists in the preparation of a textbook is an advantage, since it is becoming increasingly difficult to survey the current literature on the various topics that must be discussed."

The table of contents in its detailed form with page references is especially noteworthy. It should prove helpful to the medical student. The chapters are well divided so far as subjects are concerned. The material is up-to-date and authoritative. The illustrations are excellent.

The chapter on inflammation is so thorough that little is left to be said, so far as our present knowledge goes. Diseases of the blood is another section which was commendably prepared.

The reviewer has perused this volume with keen interest. Aside from the accuracy and authority of text material, the mechanical make-up and style adds much to the ease with which it can be read. The student can gain considerable knowledge from this book. The practitioner who desires a review or a reference on some special subject will find this the most valuable pathology which has been published in several years.

HANDBOOK OF THERAPEUTICS. By *David Campbell,* M.C., M.A., B.Sc., M.D., "Pollok" Lecturer in Materia Medica and Pharmacology in the University of Glasgow; Assistant Physician to the Western Infirmary of Glasgow; Examiner in Materia Medica and Therapeutics in the Universities of St. Andrews and Glasgow; formerly physician to outpatients, Western Infirmary; Examiner in Materia Medica and Therapeutics in the University of Aberdeen, and Rockefeller Fellow in Pharmacology and Therapeutics. Pp. 411. New York: William Wood and Co. 1930. Price $4.50 net.

The author's reason for this book is the insufficient knowledge which the medical student obtains to treat disease rationally. As is mentioned in the preface, "The importance of a more careful training in therapeutics is universally admitted, and it is hoped that this book may contribute toward that end."

There are twenty-one chapters in all, dealing with a variety of subjects, some of which are: management of the patient, the prescription, diet as a therapeutic agent, water as a therapeutic agent, heat and cold, climate, etc. Physical methods of treatment occupies a chapter. The systems of the body and the diseases incident to them are likewise discussed in separate chapters.

The chapter on physical methods of treatment is a good resumé of the more important essentials which come within the scope of this branch of therapy. The contents on special subjects, while not detailed, is sufficient for quick reference. It is a little volume well worth having in any medical library particularly because it is authoritative and includes a wide range of medical subjects.

INTERNATIONAL ABSTRACTS

Successful Treatment of Gangrene with Special Reference to Diabetic Type by Medical Diathermy. Samuel Barbash.

Jour. Med. Soc. of N. J. **27:***933 (December) 1930.*

Diathermy is a valuable adjunct in the treatment of gangrene, necrosis and ulceration.

Application of electrodes in each case must be guided by the location of the lesion.

An index to dosage is the tolerance of the patient, except in cases of spinal cord injury, when it is impossible to use the patient's sensation as a guide.

Removal of completely gangrenous parts, free incision and drainage when pus is present, and the usual antiseptic local treatment, in addition to the diathermy, are essential to healing.

Septicemia did not occur in any of our patients as a result of the use of diathermy. In the presence of free drainage, when pus is present, the danger of septicemia is small.

By the use of diathermy extensive amputations can be avoided.

The death rate is much lower than when amputation is done; there being no deaths in this series due to the gangrene *per se.*

Upon recovery the patient has full use of the limb, only occasionally losing that portion of the extremity which has become completely gangrenous.

There are a large number of diabetics throughout the country who suffer from gangrene, and a certain number of patients who suffer from trophic ulcer as a result of spinal cord lesions, and who die of septic infection. In view of these facts, it would seem that diathermy should be used in preference to, and before resorting to, radical surgery.

The diabetes and any other associated systemic conditions must be treated as such, in addition to the treatment of the gangrene.

The effect of diathermy is lasting and the collateral circulation established appears to be permanent and sufficient to maintain a good blood supply to the affected parts.

Further Advancement in Gynecological Diathermy. Thos. H. Cherry.

New York State Journal of Medicine, **30:***1333 (November 15) 1930.*

The greatest field of gynecological diathermy lies in the treatment of pelvic infections.

It has previously been an accepted fact that the gonococcus was killed at a temperature of 42° C. (107.6° F.). Quite recently Pelouze has demonstrated that this bacterium in some strains is not rendered innocuous until exposed to 47° C. (116° F.). These findings have been verified in the bacteriological laboratory of the New York Postgraduate Hospital. On account of this more recent information, the author's former ideas concerning the maximum application of heat in these infections have undergone a change. There is no doubt that this fact explains some of the failures to render the urethra and cervix free of the gonococcus, as the greatest benefit in this type of infection is derived from the bacterial action of the diathermic heat units administered.

To apply sufficient heat units to the pathology presented, various types of electrodes have been devised. For the urethra and cervix, the Corbus thermophore is most excellent, the heat units administered being more or less accurately determined by a thermometer inserted in its canal. The thermometer readings give a rough estimate of the temperature generated in the tissues themselves.

Multiple inactive electrodes are advantageous, as they reduce any feeling of heat to the patient and less amperage is necessary to maintain the required temperature. One may use the link electrodes or blocked tin on the sacral and abdominal regions. These various inactive conductors are connected to one pole of the machine by means of a multiple connector.

Through the kindness of the Adlanco Industrial Products Corporation, who contributed a set of thermocouples for research in this field, it has been made possible to test the heat reaction of various pelvic tissues subjected to known electrical forces. The work has been done on animals and the living human, and this is only a preliminary report of the research. Further investigations are being carried on, concerning the morphological and chemical changes in the tissues when subjected to different degrees of temperature.

It seems to be the general impression that possible harmful effects occur when applying heat units to pyosalpinges and tubo-ovarian abscesses; the author's hope is that this fallacy has been sufficiently disproved in the last few years. His own results in these types of cases, both in hospital and in private work, have been most satisfactory. In only two instances has a bad effect resulted from the use of diathermy. In one instance a pelvic abscess ensued. In another case an ovarian cyst was mistaken for a tubo-ovarian infection, which resulted in abscess formation. The first case necessitated a posterior colpotomy, and in the latter a laparotomy was done with the extirpation of the infected neoplasm. Accurate diagnosis before diathermy treatments are begun should be stressed, and for this reason gynecologists should apply diathermy in pelvic disorders.

With the exception of the two cases already mentioned, only two other cases have not responded to diathermic applications in the last three years.

An important part in hastening adnexal resolution is the treatment of the cervicitis that invariably

accompanies this condition. In the chronic case it is the generally accepted treatment that removal of the infected cervical mucosa and glands should be accomplished. This can best be done by coagulation diathermy.

The first cervical electrode to accurately apply coagulation to the cervix was devised by Ende.

Recently the author has been using a modification of this electrode with similar satisfactory results. Instead of two wire electrodes, there are two plates, 2.8 cm. long and 4 mm. wide, placed upon opposite sides of a non-conducting material. These are connected through the handle with terminals of the bipolar current and used in a similar manner to the Ende electrode. The depth of destruction with this electrode using 2,000 ma. is 4 mm. This has been determined by microscopical sections of amputated cervices and by the utilization of the thermocoupling at various depths of cervical tissue. Knowing the depth of destruction obtained, there cannot arise any complicating postoperative factors such as hemorrhage or stricture, which too great a depth of coagulation might bring about.

Further pathological conditions of the genital organs due to chronic infections, where coagulation diathermy is most useful, are infected Skene's glands, urethral follicles and Bartholin's glands. Abscesses of these structures are easily opened by the needle electrode under local anesthesia. The pus is readily evacuated and the opening remains patent 10 days, which allows for complete drainage and resolution. This method reduces to a simple office technic, a procedure that with the scalpel and wide incision requires hospitalization and narcosis. In the chronic infective stage of these structures, a similar technic utilized will destroy efficiently the infected sites.

As a final topic in advanced diathermy, the subject of malignancy should be discussed.

The entire cervical mass is coagulated with the needle electrode to its utmost limits without damaging important structures. The cutting electrode is then utilized to remove the coagulated cancer, leaving a cooked cavity in the vault of the vagina. The coagulation seals the lymph and blood vessels, preventing metastases and hemorrhage from the operative manipulation.

The periphery of the cancer, where there are live and actively growing malignant cells, is next attacked by inserting 12 to 15 radon seeds coated with gold at platinum. An intra-uterine stem containing three centers of radiation is next inserted, and a rubber ring pessary is placed in the vagina with two centers radiating the broad ligaments. Another stem of one center of activity is placed against the cancer cavity. This series remains for six days, that administers approximately 12,000 m. c. hours.—Abs. *Int. Med. Dig.*, **18**:201 (Apr.) 1931.

Diathermy In Dentistry. Prof. H. J. Mamlock, Berlin.

Medizinische Klinik, No. 9, 1931.

The sterilization of an infected root-canal can be accomplished most safely and simply by cooking the bacteria by diathermy. The granuloma of the tip of the root (periapical ostitic focus) then recedes of its own accord, since the disease activity in the root-canal has ceased. Preparation as for every root treatment, best with a coffer dam. Broad opening of the cavity, the openings into the canal rendered accessible. Washing of the tooth and of the cavity with tincture of iodine. The cavity is then filled with hypochlorite and this pumped into the canals with a fine needle. Patient holds the inactive electrode in his hand, while the active one, a Miller needle, is introduced into the canal. The current is set at 60 mA. and the tip of the needle moved lightly back and forth in the upper third of the canal. As soon as the patient feels any pain, he announces it by lifting his free hand, whereupon the current is immediately shut off. If he feels nothing, the current is shut off every two to three seconds (not longer!) for eight to ten seconds, to allow the tooth to cool. The second time the current is turned on the needle is pushed into the second third of the canal, the third time as deep as possible. The hypochlorite is then removed, the canal widened, and the whole procedure repeated once or twice after the insertion of chloramine. The canals are then dried with sterile paper-tips, and after that, with 50 mA. diathermy for one, two seconds. The solid filling of the root can be then made immediately, usually with complete absence of reaction. The procedure must sometimes be repeated twice or three times on different days. The opening is shut only provisionally when strong pain is present, or there is a copious flow of pus from one of the root-canals, or a strong putrid odor was present at the beginning of the treatment.

An inflamed or exposed pulpa can be removed following the application of arsenic pads or in anaesthesia by injection. After the cavity of the pulpa has been sufficiently opened, the needle electrode is inserted for one or two seconds in the canals, to cause coagulation. The pulpa is then removed. If the current is left on too long, the pulpa becomes cooked and crumby. If there had been anaesthesia by injection, the signal of the lightly painful feeling of heat is absent, and burns can easily result around the tooth. The current may therefore be left on at the most three seconds, and then interrupted for eight to ten seconds. Only after the tooth has been so cooled may the current be turned on again for two to three seconds, and not longer, even if the patient shows no pain reaction.

Sensitive dentin can be excellently anaesthesized by diathermy; this is done by stroking it rapidly with the needle electrode. Insensitiveness is achieved after a few seconds (coagulation of the fine nerve-endings in the dentin?). The procedure can be repeated after a few days.—Abs. *Ars Medici*, IX: **6**:268:269 (June) 1931.

La Diathermothérapie Dans Le Syndrome "Péricolite Droite". (Diathermotherapy in the so-called syndrome of right pericolitis). Gaston Durand and L. Delherm.

Presse méd., 1929, ann. **36**, *Nr. 6 (Jan.), p. 93-95.*

The authors analyse the results of diathermic treatment in the syndrome called by them perivis-

ceritis or pericolitis. Report of 21 cases. Of these only 4 had undergone operation, the other 17 had been operated on for chronic appendicitis. There were pains on the right side, partly also in the stomach, for the most part in half of the right abdominal portion. There was chiefly constipation. Patients were submitted to diathermic treatment with an amperage of from 1800 to 2300 treatment of 20-30 minutes each time, 20 sittings on an average. Of 21 cases ten were considerably improved, and clinically cured. The results are usually better, the sooner the cases come under treatment and in proportion to the condition of the patient's nerves. Acquired or constitutional nervousness is a handicap.

Ueber Die Wirkung Der Roentgentiefenbestrahlung Auf Gewisse Formen Der Lungentuberkulose Bei Kindern. (The action of deep roentgen ray irradiation on certain types of pulmonary tuberculosis in children). Zoltán von Bókay.

Jahrb. f. Kinderhlkde, 1929, vol. **123**, *p. 18-21.*

Bókay has obtained favorable effects in adequately selected cases by means of irradiation. Hilum processes, particularly, can be successfully influenced without exception. Distinctions, however, must be made in cases with infiltration. Very severe infiltrations were not submitted to treatment in consideration of the lethal results of the cases recorded in the literature. All the cases treated by Bókay were restricted in pathology; it is not improbable that these cases belonged to the group of the so-called epituberculous infiltrations. At all events it can be said that in careful selection of the cases one introduces a quickly acting method in x-raying. It has especially a great economic value; the method is superior to climatic and mountain therapy, which is often unattainable, preventing hospitalization and thereby also overcoming the crowding of hospitals. From 20 to 50 per cent erythema doses were given through 3 mm. Al filters at 30 cm. distance and with 100,000 voltage, which corresponds well nigh to a 10 to 25 per cent focal dose. Irradiation was always administered from two sides in a broad field, on the whole of the thoracic surface. In more severe processes (larger infiltration, severe hilum condition, children in poor condition), the dose was somewhat reduced. The lungs were then irradiated not as a whole, but only in a smaller field. The irradiation was repeated after 4 weeks; in all from 3-5 irradiations were applied.

Roentgentherapie B e i Knochengeschwuelsten. (Roentgen ray therapy in bone tumors). J. Borak.

Strahlentherapie, 1929, vol. **33**, *Nr. 3 (Aug.), p. 435-455.*

Bone granulation tumors, erroneously termed *ostitis fibrocystica* and formerly called giant cell sarcoma, offer a very good irradiation prognosis. Hence, operative treatment of bone granulation tumors, principally located in the bones of the limbs, appears superfluous. Moreover, recurrences are uncommonly rare after irradiations.

As to bone sarcomata, cases with already existent distant metastases, i. e., particularly lung metastases, are to be referred to radio-therapy on the very ground of their being inoperable. Irradiation, however, exerts a very favorable though only palliative influence. Sarcomas located in the pelvis, spine, and floor of the skull should undoubtedly be sent to radiotherapy since operative treatment is connected with very great, and even immediate risk to life. Finally, an attempt at irradiation should be made in sarcomas when otherwise only a mutilating operation could be performed, but only when the tumors in question are round cell sarcomata, for sarcomata with homogeneous structure are much more radiosensitive than are sarcomata with heterogeneous structure, such as fibro, chondro, and osteosarcomata.

All bone granulation tumors and some bone sarcomata are curable, whereas bone cancer metastases are incurable. Borak pleads against resorting to morphia at once, but for irradiating the foci instead. The patient can thus be made comfortable for many months. In several cases comfort even for years were thus obtained. The technique of treatment though rendered more difficult by the amount of metastases, is not at all final in regard to the efficiency of irradiation. In this respect the condition of the several foci plays a great part. Relief of pain is to be obtained both in osteoplastic and osteolytic processes. Regression, however, only in the latter. Intraossal metastases retrocede more easily than do foci which transgress the boundaries of bone and bulge the skin by tumor-like protrusions, as it happens frequently on the sternum and clavicle. It is still observed that breast-cancer plays the chief part in bone cancer metastases. As the metastases in question are osteolytic and usually intraossal in location, it is no rarity to observe improvements for 2-3 years following irradiation treatment of these metastases.

Accidents Éventuels Au Cours Des Traitements Par Les Rayons Ultraviolets. Comment On Peut Les Éviter. (Accidents in the course of treatment of ultraviolet rays. How they can be avoided). Susanne Delaplace.

Paris méd., 1929, vol. **71** *(April), p. 381-86.*

(1) Explosion or break of burner. These are very rare accidents; they are not dangerous, if one avoids placing the burner above the patient.

(2) Ozone poisoning can be avoided by good ventilation.

(3) Conjunctivitis is prevented by goggles.

(4) Erythema of the skin, to be checked only in treatment of cutaneous affections, is otherwise easily avoided by proper dosage.

(5) Impairment of tuberculous affections are avoidable by cautious dosage.

Enuresi Notturna E Cromoterapia Bleu. (Nocturnal enuresis and blue chromotherapy). C. Frangipane.

Policlin. sez. prat., 1929, ann. **36**, *Nr. 23 (July), p. 826-82.*

The author states that irradiation of the lumbosacral region by means of a sollux-lamp with an interposed filter of blue glass acts very favorably on nocturnal enuresis. Technique: Focal distance of about 20 cm. for 45 minutes, the first two exposures on two successive days, the remaining ones at weekly intervals. Following the first irradiation outstanding improvement in the symptoms of enuresis was noted. In one of these three cases a striking decrease in the number of urinations during the day followed. The author places particular stress on the fact that no other treatment was given at the same time. The children who underwent this treatment, were affected with rickets, adenoids or endocrine disturbances.

Inkontinenzbehandlung Bei Frauen Mit Intravesikaler Elektrokoagulation. (Treatment of urinary incontinence in women by means of intravestical electrocoagulation). Walter K. Fränkel.

Med. Klinik, 1929, ann. **25**, *Nr. 33 (Aug.), p. 1235.*

Intravesical electrocoagulation of papillomata is followed by the formation of a radiated-looking scar which is indicative of contraction or shrinkage process. The author has utilized this shrinkage process therapeutically in the relative urinary incontinence of multiparae. It manifests itself in escape of urine owing to a sudden increase in intra-abdominal pressure (laughing, sneezing, etc.), and is caused by the relaxation of the sphincter vesicae, chiefly due probably to the result of pressure on the neck of the bladder against the symphysis pubis when the head of the child is passing through.

After filling the bladder with about 200 cc. of feeble rivanol solution, the author has by means of a diathermic probe produced several coagulation areas on the sphincter portion, adjacent to the orifice, giving them a streaklike disposition, about ½ to 1 cm. in length, parallel to the body axis. The cicatrization arising on both sides of the orifice, then, has the capacity of raising the inferior, respectively posterior, border of the orifice, and by this means handicapping the escape of urine; moreover, owing to the scar produced by the coagulation, there is produced an efficient muscle contraction in the sphincter vesicae. This reinforced muscle action can be further increased and secured by adequate exercises.

Treatment of Chronic Deafness with High Frequency Sound Waves. Hamm. Braunschweig.

Klinische Wochenschrift, No. **37**, *1930.*

In the »Archives for Therapeutics of the Ear and Nose«, volume 119, Professor *Voss* (University Ear Clinic, Frankfurt am Main) and Engineer *Müllwert* reported on a new method of treatment for chronic deafness with the help of an apparatus constructed by *Müllwert,* using high frequency sound waves lying over the upper limit of sounds that can be heard by the human ear. These are conducted into the auditory canal. For the complicated physical and technical details, see the original. The author reports on his experience with the new apparatus extending over a period of more than a year. The practicing physician should know of the existence of this method, for he is the first one to recognize deafness after the grippe and other infectious diseases, and can see that the patient gets early treatment.—With deafness after radical operation for suppuration of the middle ear, the author was almost always able either to completely cure or greatly imjrove the condition, and this was formerly impossible with every known method of treatment (not excluding diathermy). Six slight and mediumly severe cases of deafness due to old age were cured promptly; ringing in the ears in the case of elderly persons was also improved. The results are very satisfactory with affections of the auditory nerve, provided the disturbance of hearing is not yet pronounced. It should be especially emphasized that the treatment may be used for the most severe cases of deafness in children with prospects of good results. The results with otosclerosis are, on the other hand, still unsatisfactory. Nevertheless the new procedure is a big step forward. The treatment must be continued for a period of from one to two months. As to how the sound waves produce their effect, it can only be guessed at so far, according to the state of *Voss* himself; it is possible that electric currents are conducted into the inner ear through the blood vessels and other tissues of the ear.—Abs. *Ars. Medici,* 11:1:36 (Jan.) 1931.

How Does Electrotherapy Affect Cardiac Weakness and Disturbances of Circulation? Prof. L. Mann. Breslau.

Zeitschrift für physikalische Therapie, vol. **34**, *No. 9, 1930.*

The essential factor is the irritation of the peripheral motor nerves. Almost any form of application (faradic brush, stabile galvanization, high frequency, etc.), produces hyperaemia of the skin, often after transitory pallor of the skin. We cannot directly affect the weakened heart itself, but we can, by electrotherapy, stimulate and regulate the peripheral circulation and thus lighten the heart's work. The most extensive vasomotor stimulation is achieved by the electric plunge-bath. The 4-cell bath, however, enjoys preference because the effect of the current is more equable and the whole process more convenient. It matters little which current (galvanic or faradic) is used. The 3-phase alternating current has been abandoned as superfluous and circumstantial; some physicians even avoid the simple alternating current (sinusoidal current) because, in certain circumstances and with a certain predisposition it may prove dangerous. *Steffens* has shown that both with the galvanic and the faradic current, half of the cases always react with an increase of blood-pressure, the other half with low-

ered blood-pressure; *de Vries-Reilingk* has observed lowering of the blood-pressure during the bath in all kinds of electric bath. In contrast to the transversely striated muscles, smooth muscle reacts better to the galvanic than to the faradic current (more intensive redness of the skin, probably due to the change of the ionic concentration). The direction of the current is also irrelevant.

The vasomotor stimulation may, by a radiating effect, produce extensive vasomotor reflexes. In this way, faradic brushing of one half of the head may produce hyperaemia of the other half (*Rumpf*). The best plan is to begin with the mildest stimulation (short, weak faradic bath) and gradually to proceed to stronger irritants. To this must be added that the capability of the nervous reaction to the stimulus increases gradually so that a permanent improvement of the circulation may finally results.—Abs. *Ars. Medici,* 11:1:10 (Jan.) 1931.

Cancer of the Skin — Cold Caustic Treatment Plus Radium. Prof. A. Buschke and L. Loewenstein, Dermatological Department of the R. Virchow Hospital, in Berlin.

(Medicinische Klinik, No. **43**, *1930.)*

In 70 cases a complete cure, also from the cosmetic point of view, was attained. Time of observation between four years and three months. Relapses occurred only rarely and in cases which had been treated differently previously (recidivation of scar after transplantation). In local anaesthesia or narcosis the tumor is first cut around with the scalpel-like instrument of the electrocoagulation apparatus. Thanks to the high frequency current of the diathermy apparatus the instrument which is blunt in itself cuts perfectly and at the same time sterilizes the incision surface and stops capillar haemorrhage by thrombosing of vessels so that the danger of a transplantation of germs is reduced. The tumor itself is completely coagulated by means of a ball-shaped blunt appendage piece and is then removed by the sharp curette or left to spontaneous discharge. This diathermy operation is nearly bloodless. The danger of recidivation and of vaccination metastasis is slighter than after bloodshedding operations because the opened lymphatic vessels are also immediately closed by coagulation. Because of the high degree of heat generated in the tumor tissue sterility is also safe-guarded, so that work can proceed without sufficient asepsis and tissues which are already affected may be attacked without any great risk. Because of the deep effect of the current the bed of the swelling can be coagulated in any desired depth. After coagulation the boiled part is first only dressed with boracic ointment.

Subsequent irradiation with x-rays should take place as soon as possible, that is after 8 to 14 days. The danger of a relapse is thus further reduced considerably. The still open surfaces of the wound make a far more effective irradiation possible than could for instance be made if the operation were closed by suture. Correct technique of the first irradiation may decide the fate of the patient. By scattered doses the tumor becomes more resistant against radium rays and its surrounding area is injured by it more and more. According to the shape of the operated ulcer, a filtered radium plate of 5.48 mg. or three radium needles in brass tubes of 8.60 mg. radiating substance, are applied from 4 to 5 times at intervals of from 8 to 14 days during four hours. The final healing of the operation area meanwhile progresses under treatment with boracic ointment and takes from 3 to 8 weeks.

The method described is also recommended in cases of lupus vulgaris, especially in the vicinity of the eyes where one cannot apply pyrogallol. Cold cautery alone renders good services with warts, milia, pigment anomalies, xanthelasma, angioma, haemorrhoids, teleangiectasias, rhinophyma and hypertrichosis. The pigments of tatooing are exposed by the electric coagulation needle and are then treated with a 20 per cent pyrogallus vaseline.—Abs. *Ars. Medici,* 11:1:32-33 (Jan.) 1931.

The Effect of Radiation on the Blood Chemistry. H. Q. Woodard and H. R. Downes.

Am. Jour. Roent., **25:***271, (Feb.) 1931.*

The authors report blood analyses on patients after Roentgen-ray treatment for tumors; in all but 2 cases high voltage Roentgen rays were used; in these 2 cases low voltage rays were used. In all cases one skin erythema dose was given. About two-thirds of the patients studied showed no reaction except an occasional vertigo; the others had various degrees of gastro-intestinal upset from slight nausea to attacks of vomiting and diarrhea. No consistent change was observed in the pH, CO_2 combining power or lactic acid content of the blood in these patients; and no significant difference was found in the acidity of the blood between patients suffering from radiation sickness and those who did not show any general reaction. In subsequent experiments on rabbits no significant change in the pH of the blood was observed after lethal doses of high voltage Roentgen rays.

G. Schaal and his associates in the University of Moscow (*Strahlentherapie,* 40:111, March 14, 1931) report a study of the potassium and calcium and K/Ca ratio in the blood following Roentgen-ray irradiation for various conditions in 20 patients. It was found that in the first few days after irradiation — usually up to the fifth day — there is a definite increase in the potassium of the blood, a decrease in the calcium and an increase of the K/Ca ratio; later the potassium decreases, the calcium increases and the K/Aa ratio is lowered. With the increase in potassium, there is a tendency to sympatheticotonia; with the increase in calcium, a tendency to vagotonia. This disturbance of the potassium-calcium equilibrium, the authors believe, explains many of the clinical results of Roentgen-ray treatments, such as the immediate reaction or radiation sickness, and the subsequent analgesic effect.—Ab. *M. T. and L. I. Med. Jour.,* 59:224 (June) 1931.

On the Demonstration of Growth Rays in Malignant Animal Tumors. Henriette Prinzessin Ypsilanti and Rhichard Paltauf.

Ztschr. f. Krebsforsch. 32:372, 1930.

Instead of the difficult technic devised by Gurwitsch to demonstrate mitogenetic rays, the authors employed Stempell's new method, which is so simple that it can be carried out in any laboratory.

They dissolved 12 gm. of gelatin in 160 c.c. of warm tap water, added 0.4 gm. of ammonium bichromate, and filtered warm. The solution must be kept in the dark. Sufficient gelatin is run out in a thin even layer upon a 9×12 cm. glass plate. After it has stiffened, one drop of a 20 per cent watery solution of silver nitrate is deposited in the middle of the gelatin. A brass plate about the size of the gelatin layer, and having a slit in the middle about 6 cm. × 1 mm., is supported on microscope slides in such a way as to lie at least 1 mm. above the gelatin with the slit directly over the drop of silver nitrate. Brass and silver nitrate must not come into contact. Over the slit there is placed a strip of cellophane, and upon this the material to be examined. The apparatus is arranged horizontally in a moist chamber on a white surface near a window, but where the sun's rays will not strike it.

If mitogenetic rays are present there will be a wedge-shaped or circular interruption in the rings and, toward the center, a yellow discoloration where the particles of silver chromate are irregularly deposited.

Although others had reported the presence of mitogenic rays in malignant tumors examined by Gurwitsch's method, the authors of this article could find no evidence of their existence in transplanted mouth carcinoma or in the Rhous chicken sarcoma with the apparatus described. (*Am. J. of Cancer,* April, 1931.)

Roentgen Ray Erythema. P. A. Meineri.

Gior. ital. di dermat. e sif. 71:951 (Aug.) 1930.

After a short period of latency, roentgen rays produce a bright erythema, which lasts for about two months, ending in pigmentation. In the experience of some observers, this erythema follows an undulating course, increasing and decreasing in intensity until its final disappearance. Tests performed on the erythematous skin with epinephrine, morphine and histamine gave results in no way different from those observed in the normal skin. The intensity of the erythematous reaction varies according to the region affected; thus equal amounts of x-rays applied to the skin of the dorsum and to that of the leg, resulted in a greater reaction of the former, of longer duration and ending in stronger pigmentation. The white blood count in the erythematous area showed first a notable increase of polymorphonuclears and later an increase of lymphocytes. The pathologic anatomy of the region affected showed a distinctive characteristic consisting in the existence of numerous polymorphonucleated cells throughout the skin, due to a disturbed process of cell division.—Abs. *Arch. Derm. & Syph.,* 23:4:741 (April) 1931.

Radiotherapy of the Spine in Some Dermatoses. M. Artom.

Gior. ital. di dermat. e sif. 71:959 (Aug.) 1930.

The author has used the Gouïn and the Pautrier technics in the treatment of several different dermatoses, with the following results:

In six cases of lichen planus, three were treated by Gouïn's method with immediate disappearance of the pruritus and reabsorption of the cutaneous lesions, but those of the mucosa of the mouth remained unimproved. Of the three cases treated by Pautrier's method, one showed no improvement at all, and two showed improvement of the subjective symptoms.

Two cases of neurodermatitis were treated by Pautrier's method with marked improvement.

Two cases of Hebra's prurigo were treated with Gouïn's technic, with no change in one case and rapid improvement in the other, followed by a relapse fifteen days later.

Two cases of urticaria of unknown origin were immediately relieved, and two others of alimentary nature were not improved.

Two cases of herpes zoster were treated by Pautrier's method with optimum results, the pain disappearing shortly after the application, and the cutaneous lesions drying up in three days.

In chronic eczema, senile pruritus, psoriasis and Duhring's disease there was no improvement.—Abs. *Arch. Derm. & Syph.,* 23:4:742 (April) 1931.

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